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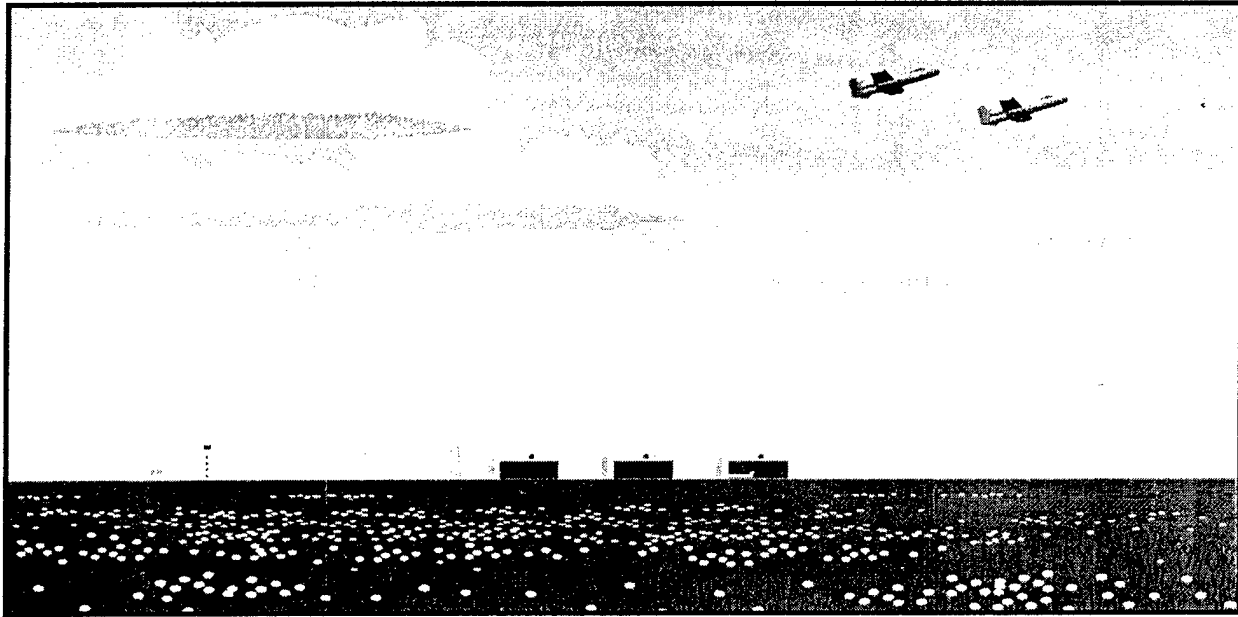
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McClellan Air Force Base

Treatability Study for Thermatrix Flameless Thermal Oxidation



Technology Demonstration
Technical Memorandum

DRAFT

NOVEMBER 1995

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1. Enclosed is the draft Technology Demonstration Technical Memorandum (TDTM) for the Treatability Study for Thermatrix Flameless Thermal Oxidation. The evaluation was conducted at the Site OU C1 test pad.
2. According to the Interagency Agreement (IAG) this is an information document and comments are not required from the IAG signatories. Participation of the McClellan AFB Innovative Technology Program partners is encouraged. Comments to the draft TDTM should be submitted by 22 Dec 95.
3. If you have any questions or concerns, please contact Mr. Tim Chapman at (916) 643-2960 or Mr. Robert Shirley (916) 643-0830 ext. 151.

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KIRK SCHMALZ, P.E.

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TREATABILITY STUDY FOR THERMATRIX FLAMELESS THERMAL OXIDATION
TECHNOLOGY DEMONSTRATION TECHNICAL MEMORANDUM

DRAFT

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November 22, 1995

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USAF CONTRACT NO. F33615-90-D-4013/0004
CONTRACTOR CONTRACT NO. 269-104, DELIVERY ORDER NO. 0004

United States Air Force
Air Force Center for Environmental Excellence, Environmental Services Office
Environmental Restoration Division (AFCEE/ESR)
Brooks AFB, Texas 78235-5000

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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 95/11/22	3. REPORT TYPE AND DATES COVERED DRAFT
4. TITLE AND SUBTITLE Treatability Study for Thermatrix Flameless Thermal Oxidation Technology Demonstration Technical Memorandum			5. FUNDING NUMBERS Contract Number F33615-90-D-4013/0004
6. AUTHOR(S) Radian Corporation			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Radian Corporation 10389 Old Placerville Road Sacramento, CA 95827			8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) SM-ALC/EMR McClellan AFB, California 95652-1036			10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT Unclassified/Unlimited			12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words) This document summarizes the results of a treatability study of the Thermatrix Flameless Thermal Oxidation technology for the treatment of VOCs in soil vapor extraction (SVE) offgas. The treatability study was conducted at the SVE and offgas cat-ox treatment system in OU C1 at McClellan AFB. This work was conducted in cooperation with the Public Partnership, Clean Sites, and the U.S. EPA Technology Innovation Office and Superfund Innovative Technology Evaluation Program.			
14. SUBJECT TERMS Title 1 Services; Treatment Technology Evaluation			15. NUMBER OF PAGES 120
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unlimited

PREFACE

Radian Corporation is a contractor for the RI/FS Program at McClellan AFB, California. This work was performed for the Air Force Center for Environmental Excellence (AFCEE/ESR) under Air Force Contract No. F33615-90-D-4013, Delivery Order 0004.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
Cal/EPA	California Environmental Protection Agency
CARB	California Air Resources Board
cat-ox	Catalytic Oxidation
cis-1,2-DCE	cis-1,2-Dichloroethene
CO	Carbon Monoxide
CO₂	Carbon Dioxide
CPVC	Chlorinated Polyvinyl Chloride
DREs	Destruction Removal Efficiencies
EPIC	Environmental Process Improvement Center
ERC	Emissions Reduction Credit
GAC	Granulated Activated Carbon
HCl	Hydrochloric Acid
Hg	Mercury
IC	Investigation Cluster
IWTP	Industrial Wastewater Treatment Plant
lb/hr	Pounds per hour
NIOSH	National Institute of Occupational Safety and Health
NO_x	Oxides of Nitrogen
O₂	Oxygen
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
ppbv	Parts per billion by volume
ppmv	Parts per million by volume
PRL	Potential Release Locations
psi	Pounds per square inch
QA/QC	Quality Assurance/Quality Control
QCDA	Quality Control Data Assessment
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
SMAQMD	Sacramento Metropolitan Air Quality Management District
SVE	Soil Vapor Extraction

LIST OF ACRONYMS AND ABBREVIATIONS (cont'd)

TCE	Trichloroethene
TDTM	Technology Demonstration Technical Memorandum
USAF	United States Air Force
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
°F	Degrees Fahrenheit

EXECUTIVE SUMMARY

This technical memorandum summarizes the results of a field treatability study of the Thermatrix Flameless Thermal Oxidation treatment technology. The study was conducted at the soil vapor extraction (SVE) system located at Operable Unit (OU) C1 at McClellan Air Force Base (AFB) from 12 September to 13 October 1995. Results of this evaluation indicate that the Thermatrix technology provides a cost competitive alternative to catalytic oxidation (cat-ox) as a method of SVE offgas treatment while producing low levels of oxides of nitrogen (NO_x).

The Thermatrix treatment unit is a flameless thermal oxidation system designed to destroy volatile organic compounds (VOCs) while producing little, or no, NO_x . This evaluation was conducted in an effort to find cost-effective alternatives to cat-ox as a method of treatment for contaminated SVE offgas that achieve the same destruction removal efficiencies (DREs).

TEST OBJECTIVES

Objectives for this evaluation were to:

- Determine the DREs of the Thermatrix unit for the contaminants found in OU C1 soil vapor, primarily trichloroethene (TCE);
- Evaluate the effectiveness of Thermatrix in removing contaminants from the offgas while meeting limits set by the Sacramento Metropolitan Air Quality Management District (SMAQMD) for NO_x ;
- Evaluate the cost effectiveness of the Thermatrix technology, as compared to cat-ox, in treating the contaminated SVE offgas; and
- Determine the technical difficulty of operating the system and evaluate the system reliability.

RESULTS

- The Thermatrix treatment unit achieved DREs for TCE in the range of 99.9% to 100.0%. Overall DREs for all VOCs averaged 99.9%.
- Results from two continuous emissions monitoring events indicated NO_x production was less than 2 parts per million by volume (ppmv) during the first round and less than 1 ppm during the second.
- Capital cost for a full-scale Thermatrix unit designed to treat 500-1,000 standard cubic feet per minute (scfm) of contaminated vapor is approximately \$500,000, including a quench/acid scrubbing system. Capital cost for a comparable cat-ox unit is approximately \$350,000.
- System uptime was greater than 98% excluding shutdowns due to components external to the Thermatrix unit (i.e., acid condensation, power outages).

CONCLUSIONS AND RECOMMENDATIONS

- Tests results demonstrate that the Thermatrix technology achieves DREs greater than those achieved by cat-ox and provides effective treatment for the contaminants found in the OU C1 soil vapor.
- Compared to cat-ox as a treatment for contaminated SVE offgas, Thermatrix provides a cost competitive alternative. Although capital costs for a Thermatrix unit are slightly higher than cat-ox, savings are realized during operation and maintenance. Because of the relative simplicity of the Thermatrix unit design, less maintenance on the unit is expected compared to that for a cat-ox system. The ceramic matrix used in the Thermatrix unit is designed to last the life of the unit unlike the catalyst in a cat-ox system.
- Production level of NO_x by the Thermatrix technology is lower than cat-ox typically less than 2 ppm. Typical NO_x emissions from a cat-ox unit are over 5 ppmv. The reduced NO_x production of the Thermatrix technology provides a advantage over cat-ox to aid in the achievement of McClellan AFB's basewide air emission goals. In addition this results in increased cost savings as fewer NO_x offsets would need to be purchased by the Base.

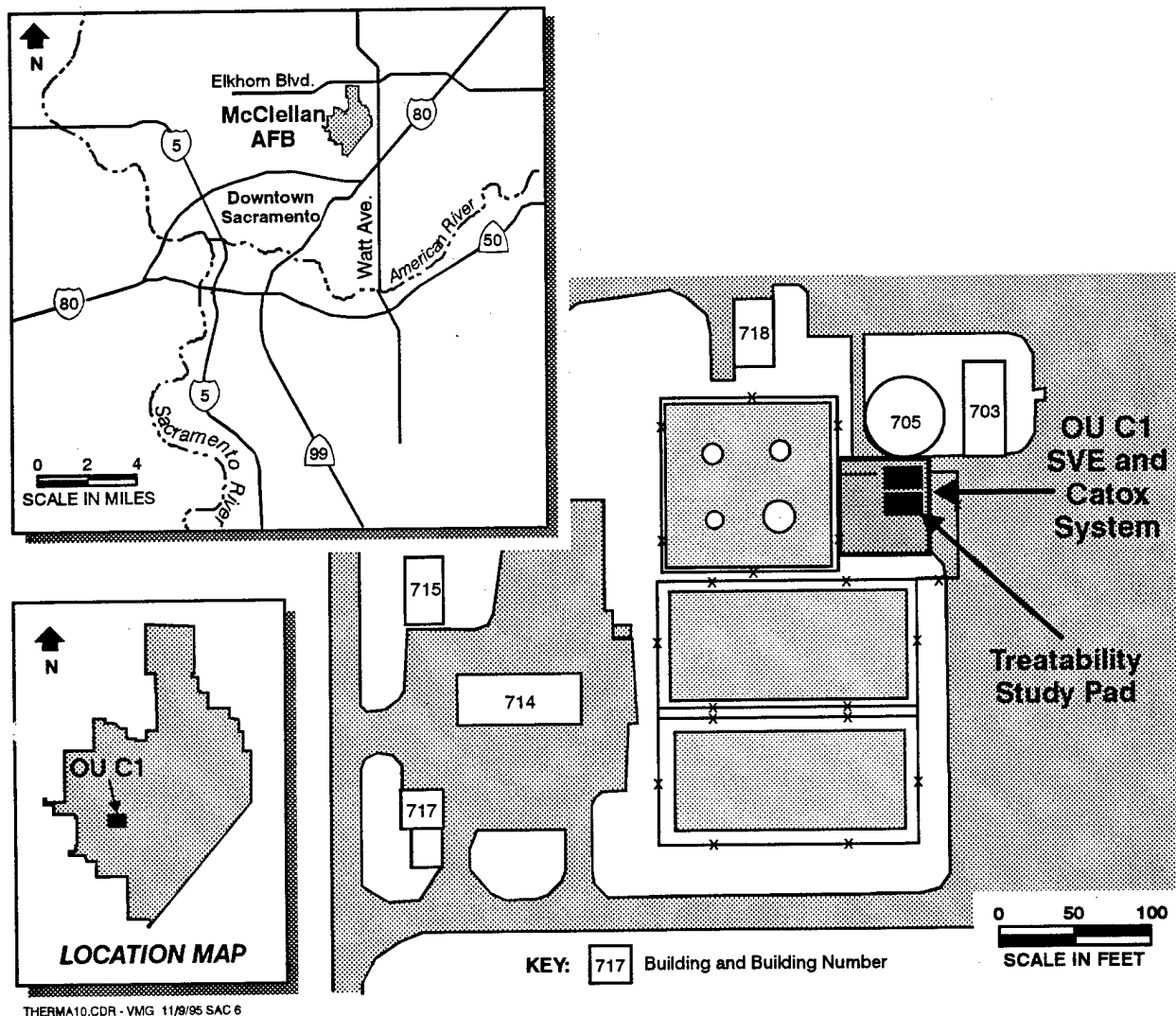
1.0 PROJECT DESCRIPTION

- This treatability study was conducted to determine the feasibility of the Thermatrix Flameless Thermal Oxidation treatment technology as an alternative to cat-ox for treatment of contaminated SVE offgas. The study was conducted at the SVE system treatability study pad located at OU C1 at McClellan AFB from 12 September to 13 October 1995.
- This demonstration was accomplished as part of the Environmental Process Improvement Center (EPIC) partnership between the California Environmental Protection Agency (Cal/EPA), the United States Environmental Protection Agency (U.S. EPA), and McClellan AFB. The evaluation was conducted in cooperation with the Public-Private Partnership formed to evaluate innovative technologies for environmental remediation of hazardous waste sites such as those at McClellan AFB. Members of this partnership include the United States Air Force (USAF), Clean Sites, U.S. EPA Technology Innovation Office and Superfund Innovative Technology Evaluation Program, Cal/EPA, Radian Corporation (Radian), Dow Chemical Company, Beazer East, Inc., Southern California Edison, Xerox Corporation, American Telephone and Telegraph Company, Monsanto Chemical Company, and DuPont Chemicals.
- All treatability study activities were conducted in accordance with the *Treatability Study for Thermatrix Flameless Thermal Oxidation Work Implementation Plan and Site Health and Safety Plan* (Radian, 1995), approved by the Air Force and regulatory agencies.

Site Background

- OU C1 covers approximately 23 acres in the southwest portion of McClellan AFB as shown in Figure 1-1. The OU is comprised of three confirmed sites (Sites 22, 42, and 69) and two Potential Release Locations (PRLs 41 and 68). The area was used from the mid-1940s to 1970 for open bulk storage and burning of liquid and solid wastes. Specific uses included waste oil and solvent storage, burn pits, a refuse incinerator, and construction debris storage and burial (URS, 1994).

Figure 1-1. Site Location

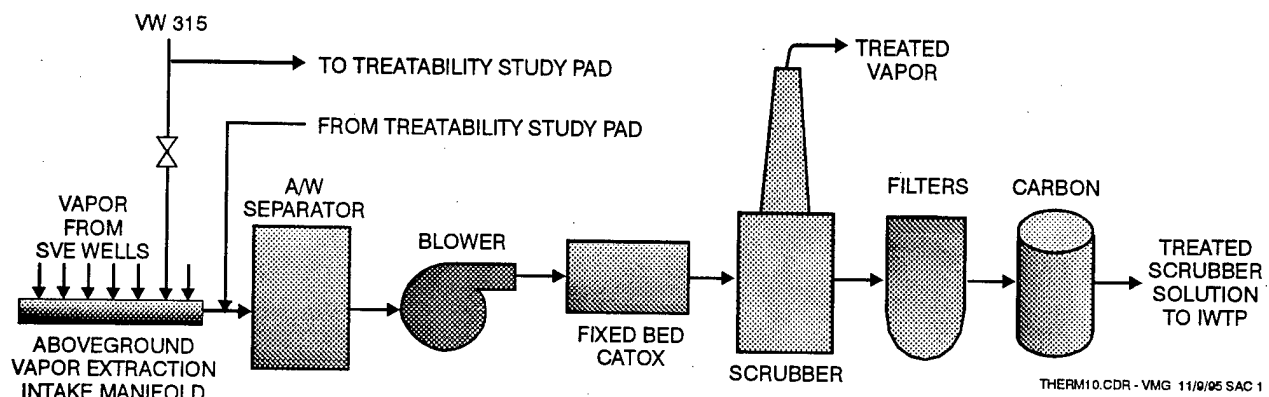


- Site 42 originally consisted of pits that reportedly held waste solvents and oil burning sludge. The northern portion of the site may also have been used as a fire training area. The Industrial Waste Treatment Plant was later constructed over this site, including an aeration basin that was removed from service in 1987, but remains in place. PRL 68 lies immediately west of Site 42 and covers four small areas corresponding to former locations of pits thought to have been used for the storage of waste oil (URS, 1994).
- Several investigations have been conducted at OU C1 since 1986 to determine the nature and extent of contamination. Volatile organic compounds have been detected in the soil and groundwater at the OU. The main contaminant of concern at the site is trichloroethene (TCE). Other contaminants of concern include cis-1,2-dichloroethene (cis-1,2-DCE), benzene, and vinyl chloride.

OU C1 SVE and Treatment System

- An SVE system, consisting of seven extraction wells, is located in OU C1 to extract contaminated soil vapor from Site 42 and PRL 68. Offgas from the wells is treated by cat-ox followed by an acid scrubber. A schematic of the system is shown in Figure 1-2. The SVE and cat-ox systems are designed to extract and treat 1,000 scfm of contaminated vapor. Vapor was extracted from an existing vapor well, VW-315, and routed through the Thermatrix unit to conduct this study.

Figure 1-2. Existing SVE and Treatment System Schematic

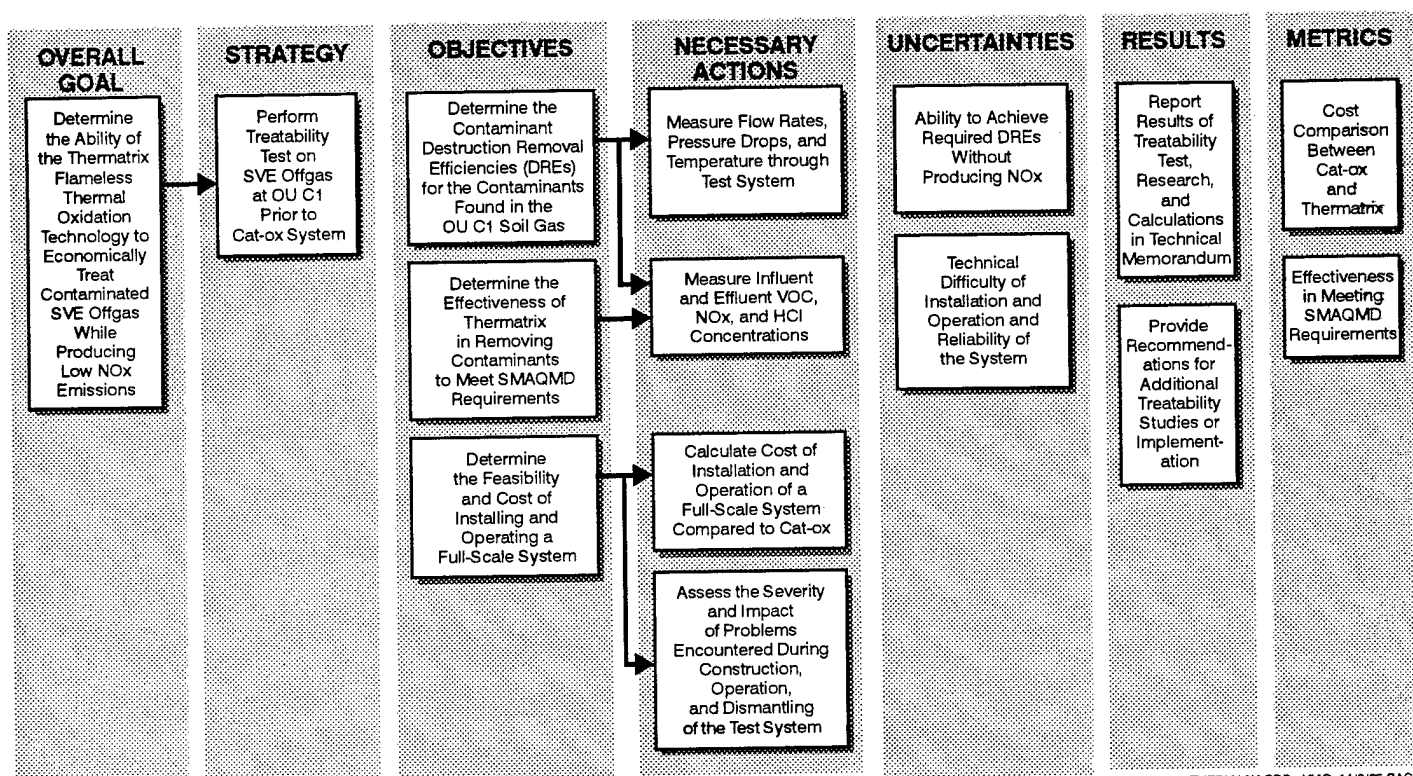


- Soil vapor from the seven wells is collected at a main manifold before entering the cat-ox unit as a single stream. For the purposes of this evaluation, the valve at VW-315 was closed at the main manifold and piping was installed to route the vapor to the Thermatrix unit.
- Extraction well VW-315 is screened from 60 to 90 feet below ground surface in the deep zone of the contaminant plume. The TCE concentrations in soil gas samples collected from this well during installation ranged from non-detect to 1,700 ppmv.

Test Objectives

The goals, strategies, and metrics established for this evaluation are presented in Figure 1-3.

Figure 1-3. Thermatrix Treatability Study Goals to Metrics



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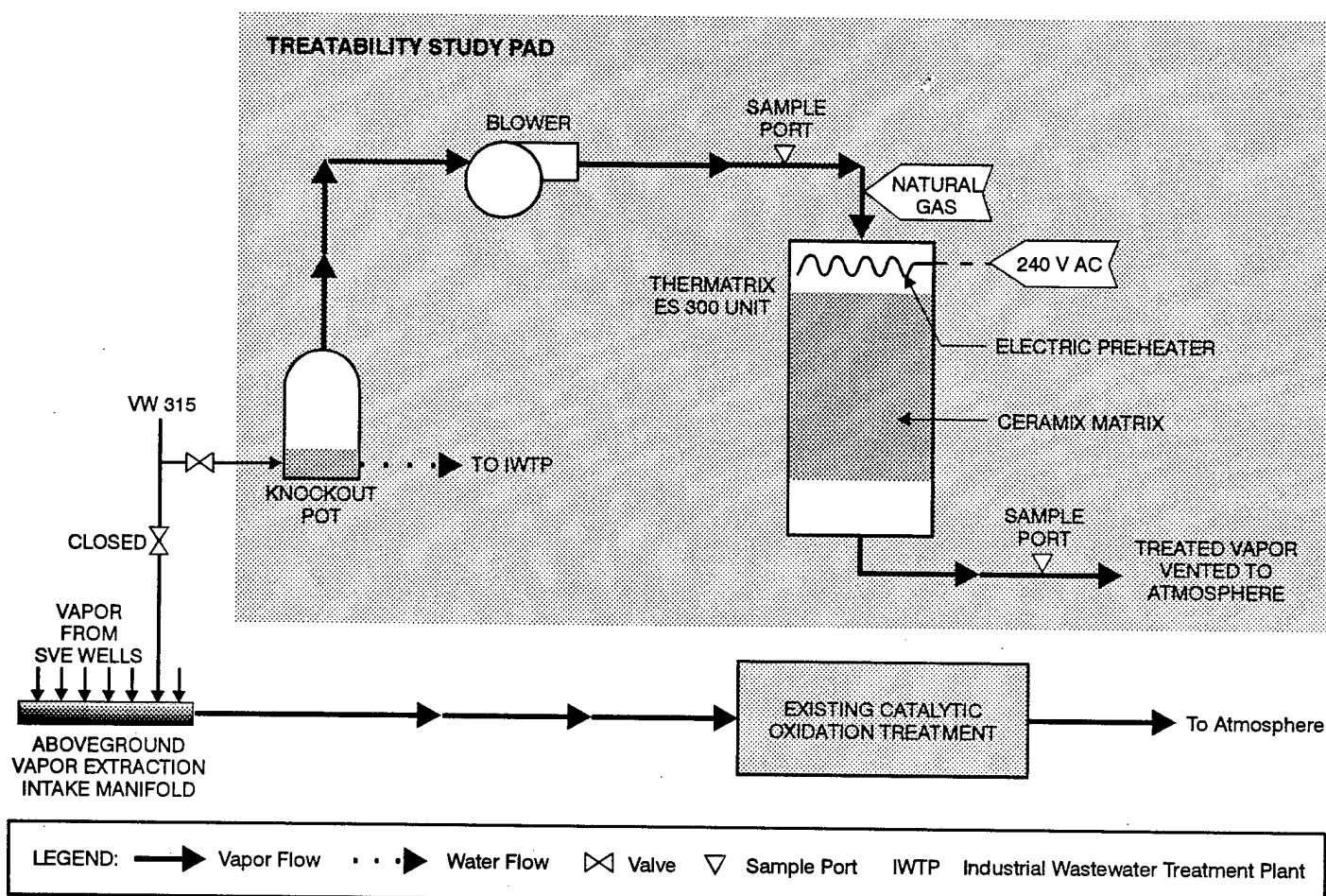
2.0 EXPERIMENTAL DESIGN

Thermatrix Test System Description and Schematic

A schematic diagram of the polymer test system is shown on Figure 2-1.

- The test system used during this evaluation consisted of a contaminated vapor stream drawn through the air/water knockout pot, into a small blower, and discharged through the Thermatrix unit. Within the Thermatrix unit, the contaminants are oxidized at a preset temperature of 1600°F in an inert, ceramic bed matrix. During the oxidation process, the VOCs react to form carbon dioxide (CO₂), water, and hydrochloric acid (HCl). To sustain the oxidation temperature, heat released by the reaction is absorbed by the large thermal mass of the ceramic matrix. An electric preheater is used during system startup and shuts off automatically once the unit reaches the set oxidation temperature.
- For treatment of chlorinated compounds, the addition of natural gas to the process flow is necessary to maintain the hydrogen-to-halogen ratio required for complete oxidation of the contaminants.
- In-line temperature sensors and microprocessor controls allow the system to maintain stable operation even for streams with widely fluctuating flow rates or organic concentrations.
- Data from tests performed by Thermatrix indicate that the technology is effective in treating VOCs over a wide range of concentrations. Test data show DREs of 99.99% or greater for VOC concentrations ranging from 400 ppmv to 31,000 ppmv. No reduction in effectiveness or adverse operating effects were reported for either high or low concentrations.

Figure 2-1. Test System Schematic



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- During destruction of chlorinated VOCs, such as TCE, the chlorine is converted to HCl. For the purposes of this treatability study it was determined, with concurrence from the SMAQMD, that HCl production would be minimal and not require the addition of an acid-scrubbing system to the unit. In a full-scale Thermatrix system, with higher flows, the HCl production rate would be great enough to require an acid-scrubbing system to remove the HCl before discharging the treated vapor to the atmosphere.
- The Thermatrix system used for this test consists of a skid-mounted ES 300 unit designed for a flow rate of 300 standard cubic feet per hour (scfh), or 5 scfm. The unit was placed on the concrete treatability study pad and connected to VW-315, prior to the cat-ox treatment system at OU C1. A blower was used to draw vapor from the well and feed it through the Thermatrix treatment system. Natural gas was plumbed to the unit and fed into the inlet stream at approximately 4 scfh.
- The test system was equipped with sampling ports for collecting inlet and outlet vapor samples. Flow meters, pressure gauges, and temperature gauges were provided for measuring the system operating parameters. Tables 2-1 and 2-2 summarize the frequency of sampling, sampling rationale, analytical methods, and quality assurance/quality control (QA/QC) procedures followed during the test.

Table 2-1. Sampling and Analysis for Chemical Parameters

Sample Location	Analyte(s) (Analytical Method)	Sample Rationale/ Data Use	Sample Frequency	QA/QC Samples
Thermatrix Unit Inlet	VOCs (TO-14, modified Method 18)	<ul style="list-style-type: none"> Measure inlet VOC concentrations Calculate contaminant DREs 	<ul style="list-style-type: none"> Week 1: Daily (5 sampling events) Weeks 2-4: 3 days per week (9 sampling events) 	10% field duplicates
Thermatrix Unit Outlet	VOCs (TO-14, modified Method 18); NO _x , CO ₂ , CO, O ₂ (CARB 100); HCl (CARB 421)	<ul style="list-style-type: none"> Measure outlet VOC, NO_x, CO₂, CO, O₂, and HCl concentrations Calculate contaminant DREs Determine air emissions 	<ul style="list-style-type: none"> Week 1: Daily for VOCs; once for NO_x, CO₂, CO, O₂, and HCl Weeks 2-4: 3 days per week for VOCs; once during week 4 for NO_x, CO₂, CO, O₂, and HCl 	10% field duplicates
Various locations at Treatability Study Pad	HCl (Draeger colorimetric tubes)	<ul style="list-style-type: none"> Health and safety sampling to ensure personnel were not exposed to hazardous levels of HCl 	<ul style="list-style-type: none"> During each site visit 	Multiple samples taken during each event

Table 2-2. Sampling for System Parameters

Sample Location	System Parameters	Sample Rationale/ Data Use	Sample Method	Sample Frequency
Thermatrix Unit Inlet and Outlet	Pressure	<ul style="list-style-type: none"> Determine pressure drop through test system 	Pressure gauges	Same as analytical sampling
	Temperature	<ul style="list-style-type: none"> Determine temperature increase across test unit. 	Temperature gauges	Same as analytical sampling
Thermatrix Unit Inlet	Flow Rate	<ul style="list-style-type: none"> Calculate contaminant removal rate 	Annubar flow measurement device	Same as analytical sampling

- Microprocessor-based controls shut down the electric preheater after the matrix has reached a preset oxidation temperature. The system operation is constantly monitored by these controls and adjustments are automatically made to ensure that the ceramic matrix remains at the proper temperature to obtain complete oxidation of the contaminants.
- The test system was equipped with control relays that shut off the blower and Thermatrix unit if the power failed. A check valve in the Thermatrix test system prevented any contaminated vapor from escaping through the system during system shutdowns.
- The system was monitored and samples collected for five consecutive days during the first continuous week of testing. During the remainder of the test, weeks two through four, samples were collected for VOC analysis using U.S. EPA Method TO-14 and modified Method 18, and the system operating parameters recorded three times per week. Sampling for NO_x, CO₂, carbon monoxide (CO), and oxygen (O₂), using California Air Resources Board (CARB) Method 100, and HCl, using CARB Method 421, were conducted twice each during the test.

3.0 TREATABILITY STUDY AND RESULTS

Test Results

- The analytical results from the test and the DREs achieved for VOCs are summarized in Table 3-1. Results from the two rounds of NO_x and HCl monitoring are summarized in Table 3-2. Laboratory analytical results of all samples taken, including the HCl and NO_x monitoring, are presented in Appendix A.
- Inlet concentrations of total VOCs during the test ranged from 370,000 parts per billion by volume (ppbv) to 710,000 ppbv.
- The Thermatrix treatment unit achieved DREs for TCE in the range of 99.9% to 100.0%. Overall DREs for all VOCs averaged 99.9%. Actual DREs may be higher. Because many of the compounds were not detected in the outlet vapor samples, the laboratory detection limit was used to calculate the DREs. However, the inlet concentrations are relatively low compared to the detection limits of the outlet samples, which may result in calculated DREs lower than the actual DREs. DREs reported for cat-ox systems currently operating at McClellan AFB range from 94-98% (URS, 1995).

Table 3-1. Summary of Test Results

Compound	Avg. Inlet Conc. (ppbv)	Avg. Outlet Conc. (ppbv)	Avg. DRE (%)
cis-1,2-DCE	18,200	2.3	99.9
Chloroform	1,871	1.5	99.9
Benzene	2,707	2.0	99.9
TCE	567,333	31.1	99.9
Toluene	1,467	2.6	99.8
m,p-Xylene	6,373	2.2	99.9
o-Xylene	5,173	2.0	99.9
Acetone	6,538	16.5	99.7
Vinyl Chloride	2,607	128.7	94.7

ppbv = parts per billion by volume

Table 3-2. Summary of NO_x and HCl Sampling

Compound ^a	Thermatrix Outlet Concentrations		
	Round 1	Round 2	Average
NO _x	1.7 ppmv	0.8 ppmv	1.3 ppmv
CO ₂	9.7%	9.4%	9.6%
CO	< 1.0 ppmv	< 0.5 ppmv	< 0.8 ppmv
O ₂	7.1%	9.8%	8.5%
HCl	0.092 lb/hr	0.045 lb/hr	0.069 lb/hr

^a Sampling for NO_x, CO₂, CO, and O₂ was performed by Best Environmental, Inc. on 9/20/95 and 10/11/95. Sampling for HCl was conducted by Radian Corp. on 9/22/95 and 10/6/95.

ppmv = Parts per million by volume.
lb/hr = Pounds per hour.

- Results from two continuous emissions monitoring events indicated NO_x production was less than 2 ppm during the first round and less than 1 ppm during the second.
- Results from the two HCl sampling results showed an average HCl production rate of 0.069 pounds per hour (lb/hr). This was well below the 0.6 lb/hr originally calculated and approved by the SMAQMD.
- The test system operating parameters monitored during the test are summarized in Table 3-3. Field data sheets containing system measurements recorded during the test are included in Appendix B.

- Actual power usage by the blower and Thermatrix preheater were not recorded during the test. The blower was on for approximately 600 hours during the 31-day test. Power usage by the preheater was limited to a couple of hours each time the unit was started up.

Table 3-3. Test System Operating Parameters

Parameter	Operating Range	Avg. Value During Test
VW-315 Vacuum	1.5 – 3.5" Hg	2.4" Hg
Blower Inlet Vacuum	12 – 16" Hg	15" Hg
Blower Outlet Pressure	0.25 – 2 psi	1.2 psi
Blower Outlet Temperature	140 – 185° F	165° F
Natural Gas Flow Rate	3 – 6 scfh	4.2 scfh
Flow Rate through Thermatrix	4.7 – 5.1 scfm	5.0 scfm
Thermatrix Oxidation Temperature	1590 – 1602° F	1600° F
Thermatrix Outlet Temperature	80 – 240° F	145° F

Operational Difficulties and Resolutions

No problems were encountered with the operation of the Thermatrix unit during the treatability test. Maintenance problems encountered were due to components external to the Thermatrix unit. These include test system modifications required to handle the unanticipated condensation of HCl in the treated exhaust gas and downtime due to external electrical problems.

- Shortly after the initial system startup, it was discovered that HCl was condensing out of the exhaust gas. The acid condensate reacted with the steel exhaust piping, creating a crystalline deposit that clogged the exhaust stack, causing a nuisance odor at the Treatability Study Pad. Design phase predictions of outlet temperatures from the unit by Thermatrix were approximately 300°F, high enough to ensure that the HCl remained in a vapor state. Because of the anticipated high temperature, steel exhaust piping was chosen during the design. However, the actual exhaust temperature observed during the test was approximately 110°F. Although the unit was expected to produce HCl during the oxidation of the VOCs, it was not anticipated that the HCl would condense out of the vapor. The problem was alleviated during the remainder of the test by replacing the steel piping with chlorinated polyvinyl chloride (CPVC) piping and adding a sealed bucket to act as a HCl knock out pot. Readings were taken using Draeger colorimetric tubes for HCl during each sampling and monitoring event to ensure that the HCl levels at the pad were below the National Institute of Occupational Safety and Health/Occupational Safety and Health Administration (NIOSH/OSHA) ceiling value of 5 ppm.
- The test system was automatically shut off several times during the initial part of the test when the OU C1 cat-ox system shut down. The control relays were initially wired to shut off the Thermatrix unit if the cat-ox system was shut off as an added precaution. It was later determined that this was not necessary and the test system was rewired to remain on when the cat-ox system shut off.

- A day and a half of downtime was experienced during the third week of the test due to power failures at the Base caused by high winds. The system was restarted several times but shut down by additional power failures. It was decided to leave the unit off until dependable power was restored.

Quality Assurance/Quality Control

- A quality control data assessment (QCDA), included as Appendix C, was performed on data to ensure that they are valid and can be used for their intended purpose. Results of the QCDA indicate that the data are valid and can be used to evaluate the performance of the Thermatrix technology. All data were collected in accordance with the *McClellan AFB Basewide RI/FS Quality Assurance Project Plan* (Radian, 1994).

4.0 COST ANALYSIS

Table 4-1 presents a cost comparison of capital and operating and maintenance (O&M) costs for cat-ox and Thermatrix as a treatment for contaminated soil vapor. Since the relative operating costs of both the Thermatrix and cat-ox systems are not highly sensitive to contaminant stream concentrations, the cost analysis was performed on a daily basis rather than cost per pound of contaminant removed. Calculations and data used to perform the cost comparison are included in Appendix D.

Table 4-1. Cost Comparison

Description	Unit Cost	Cat-ox (\$/day)	Thermatrix (\$/day)
Capital Cost ^a	Lump Sum	218.83	309.67
O&M			
Electricity	\$0.061/kWh	30.87	20.53
Natural Gas	\$0.233/therm	29.73	25.63
Labor	\$60/hr	264.00	90.00
Catalyst Replacement		9.00	N/A
NO _x ERCs		12.21	2.22
Total		564.64	448.05

^a Capital cost is a lump sum amortized over a 5-year period at 5% annual interest.
N/A = Not applicable.

Assumptions for Cost Comparison

- Continuous operation with 90% actual uptime (22 hours/day).
- 5-year project lifetime, annual adjusted interest rate of 5%.
- Inlet vapor stream concentrations similar to those at OU C1, as presented in Table 3-1.

- NO_x emissions rate for the Thermatrix unit is based on emissions monitoring performed during the treatability test.
- O&M costs for a cat-ox system are based on average monthly operating costs reported for the cat-ox systems located at Investigation Cluster (IC) 1, IC7, and OU C1 at McClellan AFB (URS, 1995).
- NO_x emissions rate for cat-ox is based on data reported for the OU C1 cat-ox system (URS, 1995).
- Capital and catalyst costs for a cat-ox system were based on a recent cost analysis by MITRE Corporation (MITRE, 1995).
- Cost of Emissions Reduction Credits (ERCs) for NO_x were based on ERC transactions conducted in 1994 (Radian, 1995).
- Costs are for comparison purposes and do not include all cost associated with design, installation, startup, O&M, or monitoring. Costs not included in the comparison, such as construction, analytical, and caustic costs, are assumed to be similar for both types of treatment systems.

5.0 LESSONS LEARNED

Performance

- DREs for VOCs, including vinyl chloride, achieved by the unit during the test were typically greater than 99.9% and as high as 100.0%.
- Production levels of NO_x were below the 2 ppmv maximum claimed by the vendor.
- The condensation of HCl in the exhaust gas presented a logistical problem during this treatability study, however it did not affect performance of the unit in treating the contaminants.

Implementation

- The Thermatrix system is easy to install and operate and requires little maintenance or monitoring during normal operation.
- Thermatrix units are custom designed and manufactured for each application. Unit size and cost are dictated by the required range of flow rates and not contaminant concentration.
- Installation and implementation considerations, including size, utility, and equipment requirements, for a full-scale Thermatrix system would be similar to those for a cat-ox system.
- Capital cost for a full-scale Thermatrix unit designed to treat 500-1,000 scfm of contaminated vapor is approximately \$500,000, including an acid scrubbing system.

- Capital cost for a full-scale Thermatrix unit designed to treat 500-1,000 scfm of contaminated vapor is approximately \$500,000, including an acid scrubbing system.
- Production of HCl during this test was at a low enough level to not require removal from the exhaust gas prior to discharge to the atmosphere, however unanticipated condensation of the HCl, due to low exit temperatures, led to modifications being required in the exhaust piping. Larger scale Thermatrix systems are designed so that the exhaust gas exiting the system is at a temperature high enough to keep the HCl in a gaseous state. A full-scale system would require a quench system followed by an acid scrubber to remove the HCl prior to discharge.
- If a Thermatrix system were to be used to replace an existing cat-ox system, cost savings could be realized by using the existing acid scrubbing system.
- Design, fabrication, and delivery of the unit would take approximately 22 weeks after receipt of a purchase order.

6.0 CONCLUSIONS AND RECOMMENDATIONS

- Tests results demonstrate that the Thermatrix technology achieves greater DREs and lower NO_x production than those achieved by cat-ox, and provides effective treatment for the contaminants found in the OU C1 soil vapor.
- The Thermatrix technology would not normally be cost effective for treatment of low-concentration contaminant streams because the size of the unit and operating cost are dependent on flow rate and not contaminant concentrations. This means that in comparing treatment of a low-concentration to a high-concentration contaminant stream, that the same size unit and actual power requirements would be necessary for destruction of less contaminant mass. An adsorptive technology, such as granulated activated carbon (GAC) would be more cost effective for treatment of low-concentration streams. A generally accepted cut-off for cost-effective treatment by GAC, as opposed to cat-ox, is VOC concentrations below 100 ppmv. Operating costs for Thermatrix are similar to cat-ox, therefore the cut-off is assumed to be the same.
- Compared to cat-ox as a treatment for contaminated SVE offgas, Thermatrix provides a cost competitive alternative. Although capital costs for a Thermatrix unit are slightly higher than cat-ox, savings are realized during operation and maintenance. Because of the relative simplicity of the Thermatrix unit design, less maintenance on the unit is expected compared to that for a cat-ox system. The ceramic matrix used in the Thermatrix unit is designed to last the life of the unit unlike the catalyst in a cat-ox system.
- Production level of NO_x by the Thermatrix technology is lower than cat-ox typically less than 2 ppm. Typical NO_x emissions from a cat-ox unit are over 5 ppmv. The reduced NO_x production of the Thermatrix technology provides a advantage over cat-ox to aid in the achievement of McClellan AFB's basewide air emission goals. In addition this results in increased cost savings as fewer NO_x offsets would need to be purchased by the Base.

7.0 REFERENCES

- MITRE Corporation, 1995. *Soil Vapor Extraction Curtailment Process Development*. Prepared for McClellan AFB/EM, McClellan AFB, California. June.
- Radian Corporation, 1994. *Installation Restoration Program Basewide RI/FS Quality Assurance Project Plan*. Final. Prepared for United States Air Force, Air Force Center for Environmental Excellence, Environmental Services Office, Environmental Restoration Division (AFCEE/ESR), Brooks AFB/EM, Texas. November.
- Radian Corporation, 1995. *Treatability Study for Thermatrix Flameless Thermal Oxidation Work Implementation Plan and Site Health and Safety Plan*. Final. Prepared for McClellan AFB/EM, McClellan AFB, California. September.
- Radian Corporation, 1995. *Casting Emission Reduction Program (CERP) Authority to Construct Permit Application Support Document, Volume I of II*. Final. Prepared for McClellan AFB, California. September.
- Thermatrix Inc., 1992. *Destruction of Organic Compounds in the Thermatrix Flameless Thermal Oxidizer*. May.
- URS Consultants, 1994. *Final Site-Specific Removal Action Work Plan for Soil Vapor Extraction System at Site OU C1*. Prepared for McClellan AFB/EM, McClellan AFB, California. December.
- URS Consultants, 1995. *McClellan AFB SVE Sites IC 1, IC 7, and OU C1 Monthly Operations Report*. Prepared for McClellan AFB/EM, McClellan AFB, California. June, July, August.

APPENDIX A
Analytical Data Sheets

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509096A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 9/13/95

DATE COMPLETED: 9/22/95

INVOICE # 8036

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u>	
			<u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-001	TO-14	9.5 "Hg	\$205.00
02A	TEN-002	TO-14	9.0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

10/12/95
S
No qual

CERTIFIED BY:

David J. Furrer

Laboratory Director

DATE:

9/22/95

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(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-001

ID#: 9509096A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9091307	Date of Collection:	9/12/95
Dil. Factor:	5600	Date of Analysis:	9/13/95
Analyst's Initials:	BJM		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	2800	Not Detected
1,1-Dichloroethene	2800	Not Detected
Freon 113	2800	Not Detected
cis-1,2-Dichloroethene	2800	19000
Chloroform	2800	Not Detected
1,1,1-Trichloroethane	2800	Not Detected
Benzene	2800	3700
Trichloroethene	2800	660000
Toluene	2800	Not Detected
Tetrachloroethene	2800	Not Detected
m,p-Xylene	2800	3800
o-Xylene	2800	3600
Acetone	11000	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	95	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-002

ID#: 9509096A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091310 Date of Collection: 9/12/95
Dil. Factor: 1.9 Date of Analysis: 9/13/95
Analyst's Initials: BJM

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.95	Not Detected
1,1-Dichloroethene	0.95	Not Detected
Freon 113	0.95	Not Detected
cis-1,2-Dichloroethene	0.95	0.98
Chloroform	0.95	Not Detected
1,1,1-Trichloroethane	0.95	Not Detected
Benzene	0.95	1.0
Trichloroethene	0.95	32
Toluene	0.95	Not Detected
Tetrachloroethene	0.95	Not Detected
m,p-Xylene	0.95	Not Detected
o-Xylene	0.95	Not Detected
Acetone	3.8	10

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	94	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	104	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509096A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091302

Date of Collection: NA

Dil. Factor: 1.0

Date of Analysis: 9/13/95

Analyst's Initials: DP

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	138 Q ✓
1,1-Dichloroethene	0.50	108
Freon 113	0.50	108
cis-1,2-Dichloroethene	0.50	106
Chloroform	0.50	102
1,1,1-Trichloroethane	0.50	102
Benzene	0.50	112
Trichloroethene	0.50	97
Toluene	0.50	102
Tetrachloroethene	0.50	91
m,p-Xylene	0.50	93
o-Xylene	0.50	98
Acetone	2.0	101

recovery out high
Samples NID. no qual.

Q = Exceeds Quality Control limits.

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	96	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	104	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509096A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9091305	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/13/95
Analyst's Initials:	DP		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	93	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	97	70-130

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THE CALVERT TEST

CONTRACT NAME: QUICKMAGE DOA

CHARGE NUMBER: 769-114-18-17

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509096B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 9/13/95

DATE COMPLETED: 9/22/95

INVOICE # 8036

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-001	Mod. Method 18	9.5 "Hg	\$50.00
02A	TEN-002	Mod. Method 18	9.0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/12/95
Z
No equal

CERTIFIED BY:

Arinda J. Freeman

Laboratory Director

DATE:

9/22/95

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Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-001	9509096B-01A	A0913003	9/12/95	Vinyl Chloride	2.0	100	3300
TEN-002	9509096B-02A	A0913004	9/12/95	Vinyl Chloride	1.9	95	Not Detected
Lab Blank	9509096B-04A	A0913002	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9509096B-03A	A0913001	NA	Vinyl Chloride	1.0	50	% Recovery 108

Analysis Date: 9/13/95
 Container Type: 6 Liter Summa Canister
 Analyst's Initials: JS
 Comments: NA = Not Applicable

5841

DO NOT WRITE IN THIS AREA

SAMPLING COMMENTS:

LABORATORY RECEIPT

Unofficial VOC

00
Samples used
9/13/95

Ward by Phil Owing 905-
913195

for QM

Q1A

02A

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / P:

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509133A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 9/15/95

DATE COMPLETED 9/22/95

INVOICE # 8037

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-003	TO-14	8.5 "Hg	\$205.00
02A	TEN-004	TO-14	8.0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

CERTIFIED BY: *Arinda S. Furrer*
Laboratory Director

DATE: 9/22/95

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AIR TOXICS LTD.

SAMPLE NAME: TIN-003

ID#: 9509133A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091606
Dil. Factor: 3700
Analyst's Initials: BJM

Date of Collection: 9/14/95

Date of Analysis: 9/16/95

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1900	Not Detected
1,1-Dichloroethene	1900	Not Detected
Freon 113	1900	Not Detected
cis-1,2-Dichloroethene	1900	21000
Chloroform	1900	2100
1,1,1-Trichloroethane	1900	Not Detected
Benzene	1900	4200
Trichloroethene	1900	690000
Toluene	1900	Not Detected
Tetrachloroethene	1900	Not Detected
m,p-Xylene	1900	6300
o-Xylene	1900	5200
Acetone	7400	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	94	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	101	70-130

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SAMPLE NAME: TEN-004

ID#: 9509133A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091607 Date of Collection: 9/14/95
Dil. Factor: 1.8 Date of Analysis: 9/16/95
Analyst's Initials: BJM

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.90	Not Detected
1,1-Dichloroethene	0.90	Not Detected
Freon 113	0.90	Not Detected
cis-1,2-Dichloroethene	0.90	1.3
Chloroform	0.90	Not Detected
1,1,1-Trichloroethane	0.90	Not Detected
Benzene	0.90	2.1
Trichloroethene	0.90	51
Toluene	0.90	3.2
Tetrachloroethene	0.90	Not Detected
m,p-Xylene	0.90	2.1
o-Xylene	0.90	1.4
Acetone	3.6	16

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	99	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	106	70-130

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SAMPLE NAME: Method Spike

ID#: 9509133A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091602 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 9/16/95
Analyst's Initials: BJM

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	121
1,1-Dichloroethene	0.50	94
Freon 113	0.50	90
cis-1,2-Dichloroethene	0.50	98
Chloroform	0.50	98
1,1,1-Trichloroethane	0.50	94
Benzene	0.50	106
Trichloroethene	0.50	92
Toluene	0.50	96
Tetrachloroethene	0.50	90
m,p-Xylene	0.50	99
o-Xylene	0.50	95
Acetone	2.0	106

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	104	70-130

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SAMPLE NAME: Lab Blank

ID#: 9509133A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9091604	Date of Collection: NA
Dil. Factor:	1.0	Date of Analysis: 9/16/95
Analyst's Initials:	BJM	

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

<u>Surrogates</u>	<u>% Recovery</u>	<u>Method Limits</u>
Octafluorotoluene	94	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	100	70-130

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WILFITE . COORDINATOR / GEN FENOMOD . DOULET NIDESTOD / DINK CALMIE C COMEDON / VELLAW . I ADDOYATON / BUIE . I ADDOYATON / REAFIT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509133B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

INVOICE # 8037

FAX: 916-362-2318

SUBCONTRACT # 259699

DATE RECEIVED: 9/15/95

PROJECT # 269-104-18-02 McClellan Thermatrix

DATE COMPLETED: 9/22/95

AMOUNT\$: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-003	Mod. Method 18	8.5 "Hg	\$50.00
02A	TEN-004	Mod. Method 18	8.0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/12/95
Z
No paid

CERTIFIED BY: Jenifer J. Fuman
Laboratory Director

DATE: 9/22/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-003	9509133B-01A	A091803	9/14/95	Vinyl Chloride	1.9	95	2400
TEN-004	9509133B-02A	A091804	9/14/95	Vinyl Chloride	2.4	120	Not Detected
Lab Blank	9509133B-04A	A091802	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9509133B-03A	A091801	NA	Vinyl Chloride	1.0	50	% Recovery 94

Analysis Date: 9/18/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

WHITIE • COORDINATOR / GOLDENROD • PROJECT DIRECTOR / PINK • SAMPLE CONTROL / YELLOW • LABORATORY / BLUE • LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509167A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/19/95
DATE COMPLETED: 9/29/95

INVOICE # 8118
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-005	TO-14	9.0 "Hg	\$205.00
02A	TEN-006	TO-14	12 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

10/12/95
S
Hogues

CERTIFIED BY:


Laboratory Director

DATE:

9/29/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-005

ID#: 9509167A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091923 Date of Collection: 9/19/95
Dil. Factor: 3800 Date of Analysis: 9/20/95
Analyst's Initials: FA

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1900	Not Detected
1,1-Dichloroethene	1900	Not Detected
Freon 113	1900	Not Detected
cis-1,2-Dichloroethene	1900	17000
Chloroform	1900	Not Detected
1,1,1-Trichloroethane	1900	Not Detected
Benzene	1900	2800
Trichloroethene	1900	570000
Toluene	1900	Not Detected
Tetrachloroethene	1900	Not Detected
m,p-Xylene	1900	7700
o-Xylene	1900	6300
Acetone	7600	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	92	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	96	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-006

ID#: 9509167A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091929 Date of Collection: 9/19/95
Dil. Factor: 7.4 Date of Analysis: 9/20/95
Analyst's Initials: LTS

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	3.7	Not Detected
1,1-Dichloroethene	3.7	Not Detected
Freon 113	3.7	Not Detected
cis-1,2-Dichloroethene	3.7	4.0
Chloroform	3.7	Not Detected
1,1,1-Trichloroethane	3.7	Not Detected
Benzene	3.7	Not Detected
Trichloroethene	3.7	110
Toluene	3.7	Not Detected
Tetrachloroethene	3.7	Not Detected
m,p-Xylene	3.7	4.2
o-Xylene	3.7	Not Detected
Acetone	15	38

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	91	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	98	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509167A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9091917	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/20/95
Analyst's Initials:	FA		

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	125
1,1-Dichloroethene	0.50	102
Freon 113	0.50	100
cis-1,2-Dichloroethene	0.50	94
Chloroform	0.50	94
1,1,1-Trichloroethane	0.50	95
Benzene	0.50	103
Trichloroethene	0.50	91
Toluene	0.50	91
Tetrachloroethene	0.50	85
m,p-Xylene	0.50	99
o-Xylene	0.50	100
Acetone	2.0	95

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	92	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509167A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9091920 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 9/20/95
Analyst's Initials: FA

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	95	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	89	70-130

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509167B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

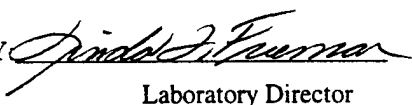
PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/19/95
DATE COMPLETED: 9/29/95

INVOICE # 8118
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-005	Mod. Method 18	9.0 "Hg	\$50.00
02A	TEN-006	Mod. Method 18	12 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/12/95
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Hogued

CERTIFIED BY


Laboratory Director

DATE: 9/29/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-005	9509167B-01A	A092007	9/19/95	Vinyl Chloride	1.9	95	2500
TEN-006	9509167B-02A	A092008	9/19/95	Vinyl Chloride	2.3	110	Not Detected
Lab Blank	9509167B-04A	A092006	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9509167B-03A	A092005	NA	Vinyl Chloride	1.0	50	% Recovery 100

Analysis Date: 9/20/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS & SPM

Comments: NA = Not Applicable

RADIAN CORPORATION

USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK

TASK OR SUB TASK (one per form):

LABORATORY NAME & ADDRESS:

THE TANNIN TOLERANCE TEST

Air Toxics

CONTRACT NAME: / 11 / 1 / M N L / 14

128 BLUE LAUREL CO. SUPERB

CHARGE NUMBER: 219-114-15-157

FISCH, CA 95630

[illegible]

RELEASED BY		DATE	TIME	COMMENTS:	
		11/11	1:22		
RECEIVED BY		DATE	TIME	RELINQUISHED BY	TIME
S. F. P. M. C.		9/19/95	13:22	E. E. P. M. C.	9/19/95 14:10
		11	:		:
		11	:		:
		11	:		:
J. F. P. M. C.		9/19/95	14:10		
DISPOSAL CONFIRMED BY		DATE	TIME	CHAIN-OF-CUSTODY RETURNED BY	
		11	:		

LABORATORY / BLUE - LABORATORY / YELLOW - LABORATORY / RED - LABORATORY / GREEN - LABORATORY / PURPLE - LABORATORY / BROWN - LABORATORY / PINK - LABORATORY / GRAY - LABORATORY / WHITE

A M. P. 202

92056

5843

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509181A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/20/95
DATE COMPLETED: 9/29/95

INVOICE # 8121
P.O. # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNTS: \$615.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-007	TO-14	10.5 "Hg	\$205.00
02A	TLX-008	TO-14	7.5 "Hg	\$205.00
03A	TEN-009	TO-14	10.5 "Hg	\$205.00
04A	Method Spike	TO-14	NA	NC
05A	Lab Blank	TO-14	NA	NC

CERTIFIED BY:

Jinda S. Freeman
Laboratory Director

DATE:

9/29/95

10/12/95
yes

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-007

ID#: 9509181A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1092110 Date of Collection: 9/20/95
Dil. Factor: 2700 Date of Analysis: 9/22/95
Analyst's Initials: FA

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1400	Not Detected
1,1-Dichloroethene	1400	Not Detected
Freon 113	1400	Not Detected
cis-1,2-Dichloroethene	1400	11000
Chloroform	1400	Not Detected
1,1,1-Trichloroethane	1400	Not Detected
Benzene	1400	1800
Trichloroethene	1400	360000
Toluene	1400	Not Detected
Tetrachloroethene	1400	Not Detected
m,p-Xylene	1400	4300
o-Xylene	1400	2600 ✓
Acetone	5400	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	109	70-130
Toluene-d8	84	70-130
4-Bromofluorobenzene	94	70-130

AIR TOXICS LTD.

SAMPLE NAME: TIX-008

ID#: 9509181A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1092111 Date of Collection: 9/20/95
Dil. Factor: 2400 Date of Analysis: 9/22/95
Analyst's Initials: FA

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1200	Not Detected
1,1-Dichloroethene	1200	Not Detected
Freon 113	1200	Not Detected
cis-1,2-Dichloroethene	1200	12000
Chloroform	1200	1400
1,1,1-Trichloroethane	1200	Not Detected
Benzene	1200	1900
Trichloroethene	1200	360000
Toluene	1200	Not Detected
Tetrachloroethene	1200	Not Detected
m,p-Xylene	1200	4700
o-Xylene	1200	3100 ✓
Acetone	4800	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	116	70-130
Toluene-d8	86	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-009

ID#: 9509181A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	1092112	Date of Collection:	9/20/95
Dil. Factor:	5.9	Date of Analysis:	9/22/95
Analyst's Initials:	SPM		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	3.0	Not Detected
1,1-Dichloroethene	3.0	Not Detected
Freon 113	3.0	Not Detected
cis-1,2-Dichloroethene	3.0	8.7
Chloroform	3.0	Not Detected
1,1,1-Trichloroethane	3.0	Not Detected
Benzene	3.0	Not Detected
Trichloroethene	3.0	250
Toluene	3.0	Not Detected
Tetrachloroethene	3.0	Not Detected
m,p-Xylene	3.0	3.3
o-Xylene	3.0	Not Detected
Acetone	12	27

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	107	70-130
Toluene-d8	84	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509181A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	1092104	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/21/95
Analyst's Initials:	EV		

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	71
1,1-Dichloroethene	0.50	77
Freon 113	0.50	91
cis-1,2-Dichloroethene	0.50	77
Chloroform	0.50	87
1,1,1-Trichloroethane	0.50	76
Benzene	0.50	73
Trichloroethene	0.50	85
Toluene	0.50	73
Tetrachloroethene	0.50	95
m,p-Xylene	0.50	78
o-Xylene	0.50	61 Q ✓
Acetone	2.0	134

Q = Exceeds Quality Control limits.

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	109	70-130
Toluene-d8	85	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509181A-05A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	1092106	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/21/95
Analyst's Initials:	EV		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	114	70-130
Toluene-d8	85	70-130
4-Bromofluorobenzene	92	70-130

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509181B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

INVOICE # 8121

FAX: 916-362-2318

P.O. # 259699

DATE RECEIVED: 9/20/95

PROJECT # 269-104-18-02 McClellan Thermatrix

DATE COMPLETED: 9/29/95

AMOUNT\$: \$150.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u>	
			<u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-007	Mod. Method 18	10.5 "Hg	\$50.00
02A	TIX-008	Mod. Method 18	7.5 "Hg	\$50.00
03A	TEN-009	Mod. Method 18	10.5 "Hg	\$50.00
04A	Method Spike	Mod. Method 18	NA	NC
05A	Lab Blank	Mod. Method 18	NA	NC

CERTIFIED BY:

Jinda S. Freeman
Laboratory Director

DATE:

9/29/95

10/12/95
Sign
NOGAL

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-007	9509181B-01A	A092106	9/20/95	Vinyl Chloride	2.1	110	1800
TIX-008	9509181B-02A	A092107	9/20/95	Vinyl Chloride	1.8	90	1700
TEN-009	9509181B-03A	A092109	9/20/95	Vinyl Chloride	2.1	110	Not Detected
Lab Blank	9509181B-05A	A092103	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							% Recovery
Method Spike	9509181B-04A	A092102	NA	Vinyl Chloride	1.0	50	92

Analysis Date: 9/21/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: SPM

Comments: NA = Not Applicable

RADIAN CORPORATION

**USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK**

10395 OLD PLACERVILLE ROAD, SACRAMENTO, CA 95827
(916) 362-5332

TASK OR SUB TASK (one per form):

LABORATORY NAME & ADDRESS:

THE EMATHS TRENABILITY TEST

Air Toxics

CONTRACT NAME: CHIC1 MCAF B DCA

19) BLUE RAINE CO. SUITE B

CHARGE NUMBER: 269-114-18-02

Folsom CA 95630

[illegible]

RELEASED BY		DATE	TIME	COMMENTS:	
[Signature]		9/20/85	2:20		
RECEIVED BY		DATE	TIME	RELINQUISHED BY	TIME
[Signature]		9/20/85	14:10	C. Chapman	14:25
		1 1	:	1 1	:
		1 1	:	1 1	:
		1 1	:	1 1	:
[Signature]		9/20/85	14:25		
DISPOSAL CONFIRMED BY		DATE	TIME	CHAIN-OF-CUSTODY RETURNED BY	TIME
[Signature]		1 1	:	1 1	:

RECEIPT FOR LABORATORY BILL

AIR TOXICS LTD.

SAMPLE NAME: TIN-010 Duplicate

ID#: 9509210A-01B

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9092526 Date of Collection: 9/21/95
Dil. Factor: 980 Date of Analysis: 9/26/95
Analyst's Initials: BJM

Compound	Det. Limit (ppbv)	Amount (ppbv)	RPD
Vinyl Chloride	490	2800	NA
1,1-Dichloroethene	490	Not Detected	NA
Freon 113	490	Not Detected	NA
cis-1,2-Dichloroethene	490	21000	4.9
Chloroform	490	1900	17
1,1,1-Trichloroethane	490	Not Detected	NA
Benzene	490	3300	0
Trichloroethene	490	> 660000 S +	3.1
Toluene	490	1300	14
Tetrachloroethene	490	Not Detected	NA
m,p-Xylene	490	7400	14
o-Xylene	490	6200	19
Acetone	2000	Not Detected	NA

S = Saturated peak; data reported as estimated.

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	98	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-011

ID#: 9509210A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092524	Date of Collection:	9/21/95
Dil. Factor:	2.1	Date of Analysis:	9/25/95
Analyst's Initials:	BJM		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1.1	Not Detected
1,1-Dichloroethene	1.1	Not Detected
Freon 113	1.1	Not Detected
cis-1,2-Dichloroethene	1.1	Not Detected
Chloroform	1.1	Not Detected
1,1,1-Trichloroethane	1.1	Not Detected
Benzene	1.1	Not Detected
Trichloroethene	1.1	Not Detected
Toluene	1.1	Not Detected
Tetrachloroethene	1.1	Not Detected
m,p-Xylene	1.1	Not Detected
o-Xylene	1.1	Not Detected
Acetone	4.2	9.5

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-012

ID#: 9509210A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9092525 Date of Collection: 9/22/95
Dil. Factor: 3.2 Date of Analysis: 9/26/95
Analyst's Initials: BJM

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1.6	Not Detected
1,1-Dichloroethene	1.6	Not Detected
Freon 113	1.6	Not Detected
cis-1,2-Dichloroethene	1.6	Not Detected
Chloroform	1.6	Not Detected
1,1,1-Trichloroethane	1.6	Not Detected
Benzene	1.6	Not Detected
Trichloroethene	1.6	Not Detected
Toluene	1.6	Not Detected
Tetrachloroethene	1.6	Not Detected
m,p-Xylene	1.6	Not Detected
o-Xylene	1.6	Not Detected
Acetone	6.4	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	100	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

AIR TOXICS LTD.

SAMPLE NAME: TIN-013

ID#: 9509210A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092528	Date of Collection:	9/22/95
Dil. Factor:	3500	Date of Analysis:	9/26/95
Analyst's Initials:	BJM		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1800	Not Detected
1,1-Dichloroethene	1800	Not Detected
Freon 113	1800	Not Detected
cis-1,2-Dichloroethene	1800	18000
Chloroform	1800	1800
1,1,1-Trichloroethane	1800	Not Detected
Benzene	1800	3000
Trichloroethene	1800	620000 E <i>st</i>
Toluene	1800	Not Detected
Tetrachloroethene	1800	Not Detected
m,p-Xylene	1800	6000
o-Xylene	1800	4600
Acetone	7000	Not Detected

E = Exceeds instrument calibration range, but within linear range.

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	99	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	96	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509210A-05A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9092518 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 9/25/95
Analyst's Initials: EV

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	119
1,1-Dichloroethene	0.50	106
Freon 113	0.50	104
cis-1,2-Dichloroethene	0.50	101
Chloroform	0.50	100
1,1,1-Trichloroethane	0.50	100
Benzene	0.50	109
Trichloroethene	0.50	99
Toluene	0.50	100
Tetrachloroethene	0.50	94
m,p-Xylene	0.50	108
o-Xylene	0.50	109
Acetone	2.0	108

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	99	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509210A-06A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092520	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/25/95
Analyst's Initials:	EV		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	95	70-130

USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK

5848

[illegible]

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

condition when receiving

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509210B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/22/95
DATE COMPLETED: 9/29/95

INVOICE # 8123
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$250.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-010	Mod. Method 18	9.5 "Hg	\$50.00
01B	TIN-010 Duplicate	Mod. Method 18	9.5 "Hg	\$50.00
02A	TEN-011	Mod. Method 18	10.5 "Hg	\$50.00
03A	TEN-012	Mod. Method 18	9.0 "Hg	\$50.00
04A	TIN-013	Mod. Method 18	9.0 "Hg	\$50.00
05A	Method Spike	Mod. Method 18	NA	NC
06A	Lab Blank	Mod. Method 18	NA	NC
06B	Lab Blank	Mod. Method 18	NA	NC

CERTIFIED BY:

David J. Fuman

Laboratory Director

DATE:

9/29/95

10/12/95
5
No qual

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)	RPD
TIN-010	9509210B-01A	A092606	9/21/95	Vinyl Chloride	2.0	100	2700	NA
TIN-010 Duplicate	9509210B-01B	A092727	9/21/95	Vinyl Chloride	2.0	100	2100	25
TEN-011	9509210B-02A	A092607	9/21/95	Vinyl Chloride	2.1	110	Not Detected	NA
TEN-012	9509210B-03A	A092609	9/22/95	Vinyl Chloride	1.9	95	Not Detected	NA
TIN-013	9509210B-04A	A092610	9/22/95	Vinyl Chloride	1.9	95	2500	NA
Lab Blank	9509210B-06A	A092603	NA	Vinyl Chloride	1.0	50	Not Detected	NA
Lab Blank	9509210B-06B	A092709	NA	Vinyl Chloride	1.0	50	Not Detected	NA
Spiked Sample							% Recovery	
Method Spike	9509210B-05A	A092601	NA	Vinyl Chloride	1.0	50	103	NA

Analysis Date: 9/26/95 & 9/27/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509235A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 9/25/95

DATE COMPLETED: 9/29/95

INVOICE # 8125

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-014	TO-14	9.0 "Hg	\$205.00
02A	TEN-015	TO-14	9.0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

CERTIFIED BY

Jinda S. Furrman
Laboratory Director

DATE:

9/29/95

10/12/95
5
NO gnd

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(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-014

ID#: 9509235A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9092624
Dil. Factor: 3800
Analyst's Initials: LTS

Date of Collection: 9/25/95
Date of Analysis: 9/26/95

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1900	Not Detected
1,1-Dichloroethene	1900	Not Detected
Freon 113	1900	Not Detected
cis-1,2-Dichloroethene	1900	16000
Chloroform	1900	Not Detected
1,1,1-Trichloroethane	1900	Not Detected
Benzene	1900	2300
Trichloroethene	1900	540000
Toluene	1900	Not Detected
Tetrachloroethene	1900	Not Detected
m,p-Xylene	1900	4800
o-Xylene	1900	3400
Acetone	7600	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	98	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-015

ID#: 9509235A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092625	Date of Collection:	9/25/95
Dil. Factor:	6.4	Date of Analysis:	9/26/95
Analyst's Initials:	LTS		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	3.2	Not Detected
1,1-Dichloroethene	3.2	Not Detected
Freon 113	3.2	Not Detected
cis-1,2-Dichloroethene	3.2	Not Detected
Chloroform	3.2	Not Detected
1,1,1-Trichloroethane	3.2	Not Detected
Benzene	3.2	Not Detected
Trichloroethene	3.2	Not Detected
Toluene	3.2	Not Detected
Tetrachloroethene	3.2	Not Detected
m,p-Xylene	3.2	Not Detected
o-Xylene	3.2	Not Detected
Acetone	13	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	100	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	101	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509235A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9092619 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 9/26/95
Analyst's Initials: EV

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	129
1,1-Dichloroethene	0.50	104
Freon 113	0.50	102
cis-1,2-Dichloroethene	0.50	96
Chloroform	0.50	94
1,1,1-Trichloroethane	0.50	91
Benzene	0.50	106
Trichloroethene	0.50	91
Toluene	0.50	93
Tetrachloroethene	0.50	88
m,p-Xylene	0.50	106
o-Xylene	0.50	98
Acetone	2.0	100

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509235A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092621	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/26/95
Analyst's Initials:	EV		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	99	70-130

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WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509235B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

INVOICE # 8125

FAX: 916-362-2318

SUBCONTRACT # 259699

DATE RECEIVED: 9/25/95

PROJECT # 269-104-18-02 McClellan Thermatrix

DATE COMPLETED: 9/29/95

AMOUNT\$: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u>	
			<u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-014	Mod. Method 18	9.0 "Hg	\$50.00
02A	TEN-015	Mod. Method 18	9.0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/17/95
S
Noques

CERTIFIED BY:

Grinda J. Fuuma

Laboratory Director

DATE:

9/29/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-014	9509235B-01A	A092613	9/25/95	Vinyl Chloride	1.9	95	2800
TEN-015	9509235B-02A	A092614	9/25/95	Vinyl Chloride	1.9	95	Not Detected
Lab Blank	9509235B-04A	A092603	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9509235B-03A	A092601	NA	Vinyl Chloride	1.0	50	% Recovery 103

Analysis Date: 9/26/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

**USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK**

10395 OLD PLACERVILLE ROAD, SACRAMENTO, CA 95827
(916) 362-5332

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5849

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COORDINATOR / COORDINADOR : PROJECT DIRECTOR / DIRECTOR DE PROYECTO : LABORATORY / HUEF. LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509271A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/27/95
DATE COMPLETED: 10/6/95

INVOICE # 8187
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$410.00

FRACTION

01A
02A
03A
04A

NAME

TIN-016
TEN-017
Method Spike
Lab Blank

TEST

TO-14
TO-14
TO-14
TO-14

RECEIPT

VAC./PRES.

9.5 "Hg
10.5 "Hg
NA
NA

PRICE

\$205.00
\$205.00
NC
NC

CERTIFIED BY:

J Linda J. Fuman
Laboratory Director

DATE:

10/13/95
J
yes good
10/6/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-016

ID#: 9509271A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092723	Date of Collection:	9/27/95
Dil. Factor:	2400	Date of Analysis:	9/27/95
Analyst's Initials:	LTS		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1200	Not Detected
1,1-Dichloroethene	1200	Not Detected
Freon 113	1200	Not Detected
cis-1,2-Dichloroethene	1200	14000
Chloroform	1200	Not Detected
1,1,1-Trichloroethane	1200	Not Detected
Benzene	1200	1900
Trichloroethene	1200	470000 E J4
Toluene	1200	Not Detected
Tetrachloroethene	1200	Not Detected
m,p-Xylene	1200	5400
o-Xylene	1200	3900
Acetone	4800	Not Detected

E = Exceeds instrument calibration range, but within linear range.

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-017

ID#: 9509271A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092726	Date of Collection:	9/27/95
Dil. Factor:	2.1	Date of Analysis:	9/28/95
Analyst's Initials:	LTS		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1.1	Not Detected
1,1-Dichloroethene	1.1	Not Detected
Freon 113	1.1	Not Detected
cis-1,2-Dichloroethene	1.1	Not Detected
Chloroform	1.1	Not Detected
1,1,1-Trichloroethane	1.1	Not Detected
Benzene	1.1	Not Detected
Trichloroethene	1.1	Not Detected
Toluene	1.1	Not Detected
Tetrachloroethene	1.1	Not Detected
m,p-Xylene	1.1	Not Detected
o-Xylene	1.1	Not Detected
Acetone	4.2	34

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509271A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9092718	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	9/27/95
Analyst's Initials:	BJM		

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	135 Q ✓
1,1-Dichloroethene	0.50	102
Freon 113	0.50	103
cis-1,2-Dichloroethene	0.50	96
Chloroform	0.50	92
1,1,1-Trichloroethane	0.50	91
Benzene	0.50	105
Trichloroethene	0.50	89
Toluene	0.50	92
Tetrachloroethene	0.50	82
m,p-Xylene	0.50	92
o-Xylene	0.50	88
Acetone	2.0	102

Q = Exceeds Quality Control limits of 70% to 130%.

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509271A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9092721 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 9/27/95
Analyst's Initials: LTS

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	95	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	99	70-130

9509271A

**10395 OLD PLACERVILLE ROAD, SACRAMENTO, CA 95827
(916) 362-5332**

2585

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROLS / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509271B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

INVOICE # 8187

FAX: 916-362-2318

SUBCONTRACT # 259699

DATE RECEIVED: 9/27/95

PROJECT # 269-104-18-02 McClellan Thermatrix

DATE COMPLETED: 10/6/95

AMOUNTS: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-016	Mod. Method 18	9.5 "Hg	\$50.00
02A	TEN-017	Mod. Method 18	10.5 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/19/95
S
No qual

CERTIFIED BY:

Jinda S. Fuman

Laboratory Director

DATE:

10/6/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-016	9509271B-01A	A092816	9/27/95	Vinyl Chloride	9.8	490	4600
TEN-017	9509271B-02A	A092814	9/27/95	Vinyl Chloride	2.1	110	Not Detected
Lab Blank	9509271B-04A	A092812	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							% Recovery
Method Spike	9509271B-03A	A092810	NA	Vinyl Chloride	1.0	50	72

Analysis Date: 9/28/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

01A 02A

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509313A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/29/95
DATE COMPLETED: 10/6/95

INVOICE # 8189
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-018	TO-14	2.5 "Hg	\$205.00
02A	TEN-019	TO-14	2.5 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

10/10/95
S
no ques

CERTIFIED BY:

Jinda S. Fournier
Laboratory Director

DATE:

10/6/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-018

ID#: 9509313A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100210	Date of Collection:	9/29/95
Dil. Factor:	1500	Date of Analysis:	10/2/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	750	1800
1,1-Dichloroethene	750	Not Detected
Freon 113	750	Not Detected
cis-1,2-Dichloroethene	750	21000
Chloroform	750	2000
1,1,1-Trichloroethane	750	Not Detected
Benzene	750	2500
Trichloroethene	750	570000
Toluene	750	1300
Tetrachloroethene	750	Not Detected
m,p-Xylene	750	7100
o-Xylene	750	6000
Acetone	3000	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	104	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	94	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-019

ID#: 9509313A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5100209 Date of Collection: 9/29/95
Dil. Factor: 5.8 Date of Analysis: 10/2/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	2.9	Not Detected
1,1-Dichloroethene	2.9	Not Detected
Freon 113	2.9	Not Detected
cis-1,2-Dichloroethene	2.9	Not Detected
Chloroform	2.9	Not Detected
1,1,1-Trichloroethane	2.9	Not Detected
Benzene	2.9	Not Detected
Trichloroethene	2.9	Not Detected
Toluene	2.9	Not Detected
Tetrachloroethene	2.9	Not Detected
m,p-Xylene	2.9	Not Detected
o-Xylene	2.9	Not Detected
Acetone	12	16

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	88	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9509313A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100202	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/2/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	97
1,1-Dichloroethene	0.50	103
Freon 113	0.50	98
cis-1,2-Dichloroethene	0.50	95
Chloroform	0.50	100
1,1,1-Trichloroethane	0.50	102
Benzene	0.50	92
Trichloroethene	0.50	87
Toluene	0.50	84
Tetrachloroethene	0.50	81
m,p-Xylene	0.50	90
o-Xylene	0.50	85
Acetone	2.0	103

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	103	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	109	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9509313A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100206	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/2/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	105	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	73	70-130

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9509313B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 9/29/95
DATE COMPLETED: 10/6/95

INVOICE # 8189
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$50.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-018*	Mod. Method 18	2.5 "Hg	NC
02A	TEN-019	Mod. Method 18	2.5 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/10/95
No gues

LAB NARRATIVE:

*Sample not analyzed per client's request.

CERTIFIED BY:

Jennifer L. Freeman

Laboratory Director

DATE:

10/6/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-018*	9509313B-01A	NA	9/29/95	Vinyl Chloride	1.0	50	Not Analyzed
TEN-019	9509313B-02A	A100204	9/29/95	Vinyl Chloride	1.5	75	Not Detected
Lab Blank	9509313B-04A	A100202	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9509313B-03A	A100201	NA	Vinyl Chloride	1.0	50	% Recovery 91

Analysis Date: 10/2/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

*Sample not analyzed per client's request.

10395 OLD PLACERVILLE ROAD, SACRAMENTO, CA 95827
(916) 362-5332

10395 OLD PLACERVILLE ROAD, SACRAMENTO, CA 95827
(916) 362-5332

10395 OLD PLACERVILLE ROAD, SACRAMENTO, CA 95827
(916) 362-5332

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510008A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/2/95
DATE COMPLETED: 10/6/95

INVOICE # 8193
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$615.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-20	TO-14	1.5 "Hg	\$205.00
01B	TIN-20 Duplicate	TO-14	1.5 "Hg	\$205.00
02A	TEN-21	TO-14	3.0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC
04B	Lab Blank	TO-14	NA	NC

10/10/95
S
yes good

CERTIFIED BY: Sandra D. Furman
Laboratory Director

DATE: 10/6/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-20

ID#: 9510008A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5100315 Date of Collection: 10/2/95
Dil. Factor: 2800 Date of Analysis: 10/3/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1400	1900
1,1-Dichloroethene	1400	Not Detected
Freon 113	1400	Not Detected
cis-1,2-Dichloroethene	1400	23000
Chloroform	1400	2400
1,1,1-Trichloroethane	1400	Not Detected
Benzene	1400	2400
Trichloroethene	1400	660000 E
Toluene	1400	1800
Tetrachloroethene	1400	Not Detected
m,p-Xylene	1400	8800
o-Xylene	1400	8200
Acetone	5600	Not Detected

E = Exceeds instrument calibration range, but within linear range.

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	105	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	91	70-130

AIR TOXICS LTD.

SAMPLE NAME: TIN-20 Duplicate

ID#: 9510008A-01B

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5100316 Date of Collection: 10/2/95
Dil. Factor: 2800 Date of Analysis: 10/3/95
Analyst's Initials: LTS

Compound	Det. Limit (ppbv)	Amount (ppbv)	RPD
Vinyl Chloride	1400	2400	23
1,1-Dichloroethene	1400	Not Detected	NA
Freon 113	1400	Not Detected	NA
cis-1,2-Dichloroethene	1400	23000	0
Chloroform	1400	2400	0
1,1,1-Trichloroethane	1400	Not Detected	NA
Benzene	1400	2400	0
Trichloroethene	1400	670000 E > +	1.5
Toluene	1400	1700	5.7
Tetrachloroethene	1400	Not Detected	NA
m,p-Xylene	1400	8700	1.1
o-Xylene	1400	7200	13
Acetone	5600	Not Detected	NA

E = Exceeds instrument calibration range, but within linear range.

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	107	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	85	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-21

ID#: 9510008A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100325	Date of Collection:	10/2/95
Dil. Factor:	3.0	Date of Analysis:	10/4/95
Analyst's Initials:	EV		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1.5	Not Detected
1,1-Dichloroethene	1.5	Not Detected
Freon 113	1.5	Not Detected
cis-1,2-Dichloroethene	1.5	Not Detected
Chloroform	1.5	Not Detected
1,1,1-Trichloroethane	1.5	Not Detected
Benzene	1.5	1.8
Trichloroethene	1.5	Not Detected
Toluene	1.5	3.2
Tetrachloroethene	1.5	Not Detected
m,p-Xylene	1.5	Not Detected
o-Xylene	1.5	Not Detected
Acetone	6.0	14

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	100	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	109	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9510008A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100302	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/3/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	84
1,1-Dichloroethene	0.50	95
Freon 113	0.50	92
cis-1,2-Dichloroethene	0.50	97
Chloroform	0.50	95
1,1,1-Trichloroethane	0.50	99
Benzene	0.50	89
Trichloroethene	0.50	82
Toluene	0.50	90
Tetrachloroethene	0.50	82
m,p-Xylene	0.50	93
o-Xylene	0.50	89
Acetone	2.0	103

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	99	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	95	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510008A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100305	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/3/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	107	70-130
Toluene-d8	93	70-130
4-Bromofluorobenzene	71	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510008A-04B

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100321	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/3/95
Analyst's Initials:	EV		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	106	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	86	70-130

RADIAN
CORPORATION

**USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK**

**10389 ROCKINGHAM ROAD, SACRAMENTO, CA 95827
(916) 362-5332**

TASK OR SUB TASK (one per form):

LABORATORY NAME & ADDRESS:

RNA: fix IDENTABILITY

ALL TOXES L7D

CONTRACT NAME: OUC / M2118 004

160 BLUE BAYLINE RD. ST. B.

CHARGE NUMBER: 719 = 104 - 18 = 07

Salmon, A 61130

[illegible]

RELEASED BY		DATE	TIME	COMMENTS:	
[Signature]		10/1/85	11:25		
RECEIVED BY		DATE	TIME	RELINQUISHED BY	DATE
[Signature]		10/1/85	11:55	[Signature]	10/1/85
[Signature]		10/1/85	12:10	G. Chapman	10/12/85
[Signature]		10/12/85	14:20		
		11	:		
		11	:		
DISPOSAL CONFIRMED BY		DATE	TIME	CHAIN-OF-CUSTODY RETURNED BY	DATE
		11	:		

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

Q. What is the effect of the V. N. Nono / in Tama

Q. What is the effect of the V. N. Nono / in Tama

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510008B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/2/95
DATE COMPLETED: 10/13/95

INVOICE # 8264
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$50.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-20*	Mod. Method 18	1.5 "Hg	NC
02A	TEN-21	Mod. Method 18	3.0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/18/95
S
No ques

LAB NARRATIVE:

*Sample not analyzed per client's request.

CERTIFIED BY:

J. J. Furrer
Laboratory Director

DATE:

10/13/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-20*	9510008B-01A	NA	10/2/95	Vinyl Chloride	1.0	50	Not Analyzed
TEN-21	9510008B-02A	A100403	10/2/95	Vinyl Chloride	2.0	100	Not Detected
Lab Blank	9510008B-04A	A100402	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9510008B-03A	A100401	NA	Vinyl Chloride	1.0	50	% Recovery 94

Analysis Date: 10/4/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

*Sample not analyzed per client's request.

CHAIN OF CUSTODY RECORD

USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK

0301

LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510036A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/4/95
DATE COMPLETED: 10/13/95

INVOICE # 8265
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-022	TO-14	0 "Hg	\$205.00
02A	TEN-023	TO-14	0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC
04B	Lab Blank	TO-14	NA	NC

10/18/95
No question

CERTIFIED BY

Amelia H. Fuma
Laboratory Director

DATE:

10/13/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-022

ID#: 9510036A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9100434
Dil. Factor: 3800
Analyst's Initials: BJM

Date of Collection: 10/4/95

Date of Analysis: 10/5/95

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1900	Not Detected
1,1-Dichloroethene	1900	Not Detected
Freon 113	1900	Not Detected
cis-1,2-Dichloroethene	1900	19000
Chloroform	1900	Not Detected
1,1,1-Trichloroethane	1900	Not Detected
Benzene	1900	3400
Trichloroethene	1900	590000
Toluene	1900	Not Detected
Tetrachloroethene	1900	Not Detected
m,p-Xylene	1900	6800
o-Xylene	1900	4900
Acetone	7600	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	95	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-023

ID#: 9510036A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100512	Date of Collection:	10/4/95
Dil. Factor:	3.0	Date of Analysis:	10/5/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1.5	Not Detected
1,1-Dichloroethene	1.5	Not Detected
Freon 113	1.5	Not Detected
cis-1,2-Dichloroethene	1.5	Not Detected
Chloroform	1.5	Not Detected
1,1,1-Trichloroethane	1.5	Not Detected
Benzene	1.5	Not Detected
Trichloroethene	1.5	2.8
Toluene	1.5	Not Detected
Tetrachloroethene	1.5	Not Detected
m,p-Xylene	1.5	Not Detected
o-Xylene	1.5	Not Detected
Acetone	6.0	6.4

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	95	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9510036A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9100421 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 10/4/95
Analyst's Initials: EV

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	125
1,1-Dichloroethene	0.50	100
Freon 113	0.50	96
cis-1,2-Dichloroethene	0.50	93
Chloroform	0.50	94
1,1,1-Trichloroethane	0.50	92
Benzene	0.50	103
Trichloroethene	0.50	87
Toluene	0.50	93
Tetrachloroethene	0.50	82
m,p-Xylene	0.50	94
o-Xylene	0.50	96
Acetone	2.0	108

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	99	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	102	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510036A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 9100423 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 10/5/95
Analyst's Initials: EV

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	98	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510036A-04B

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5100504	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/5/95
Analyst's Initials:	MH		

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	108	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	83	70-130

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@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510036B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 10/4/95

DATE COMPLETED: 10/13/95

INVOICE # 8265

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$150.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u>	
			<u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-022	Mod. Method 18	0 "Hg	\$50.00
01B	TIN-022 Duplicate	Mod. Method 18	0 "Hg	\$50.00
02A	TEN-023	Mod. Method 18	0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC
04B	Lab Blank	Mod. Method 18	NA	NC

10/13/95
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CERTIFIED BY:

Janita J. Trueman

Laboratory Director

DATE:

10/13/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)	RPD
TIN-022	9510036B-01A	A100504	10/4/95	Vinyl Chloride	1.3	65	2800	NA
TIN-022 Duplicate	9510036B-01B	A100904	10/4/95	Vinyl Chloride	1.3	65	2100	28
TEN-023	9510036B-02A	A100505	10/4/95	Vinyl Chloride	1.3	65	Not Detected	NA
Lab Blank	9510036B-04A	A100503	NA	Vinyl Chloride	1.0	50	Not Detected	NA
Lab Blank	9510036B-04B	A100902	NA	Vinyl Chloride	1.0	50	Not Detected	NA
Spiked Sample							% Recovery	
Method Spike	9510036B-03A	A100502	NA	Vinyl Chloride	1.0	50	121	NA

Analysis Date: 10/5/95 & 10/9/95
Container Type: 6 Liter Summa Canister
Analyst's Initials: JS

Comments: NA = Not Applicable

WHITE · COORDINATOR / GOLDENROD · PROJECT DIRECTOR / PINK · SAMPLE CONTROL / YELLOW · LABORATORY / BLUE · LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510085A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/9/95
DATE COMPLETED: 10/13/95

INVOICE # 8266
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNTS: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-024	TO-14	2.5 "Hg	\$205.00
02A	TEN-025	TO-14	2.5 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

10/26/95
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No gues

CERTIFIED BY:

J. J. Freeman
Laboratory Director

DATE:

10/13/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-024

ID#: 9510085A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101025 Date of Collection: 10/6/95
Dil. Factor: 3600 Date of Analysis: 10/11/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1800	Not Detected
1,1-Dichloroethene	1800	Not Detected
Freon 113	1800	Not Detected
cis-1,2-Dichloroethene	1800	20000
Chloroform	1800	Not Detected
1,1,1-Trichloroethane	1800	Not Detected
Benzene	1800	2500
Trichloroethene	1800	560000
Toluene	1800	Not Detected
Tetrachloroethene	1800	Not Detected
m,p-Xylene	1800	7500
o-Xylene	1800	6800
Acetone	7200	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	102	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	77	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-025

ID#: 9510085A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101024 Date of Collection: 10/6/95
Dil. Factor: 4.7 Date of Analysis: 10/11/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	2.4	Not Detected
1,1-Dichloroethene	2.4	Not Detected
Freon 113	2.4	Not Detected
cis-1,2-Dichloroethene	2.4	Not Detected
Chloroform	2.4	Not Detected
1,1,1-Trichloroethane	2.4	Not Detected
Benzene	2.4	Not Detected
Trichloroethene	2.4	4.1
Toluene	2.4	Not Detected
Tetrachloroethene	2.4	Not Detected
m,p-Xylene	2.4	4.1
o-Xylene	2.4	3.6
Acetone	9.4	10

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	94	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	106	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9510085A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	5101018	Date of Collection:	NA
Dil. Factor:	1.0	Date of Analysis:	10/10/95
Analyst's Initials:	BJM		

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	102
1,1-Dichloroethene	0.50	107
Freon 113	0.50	95
cis-1,2-Dichloroethene	0.50	103
Chloroform	0.50	103
1,1,1-Trichloroethane	0.50	100
Benzene	0.50	106
Trichloroethene	0.50	94
Toluene	0.50	100
Tetrachloroethene	0.50	95
m,p-Xylene	0.50	101
o-Xylene	0.50	108
Acetone	2.0	78

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510085A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101021 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 10/10/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	101	70-130
Toluene-d8	95	70-130
4-Bromofluorobenzene	72	70-130

951085

**10389 ROCKINGHAM ROAD, SACRAMENTO, CA 95827
(916) 362-5332**

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WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

10/27/95

Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

Dear Courtney:

The enclosed diskette is being provided by Air Toxics Ltd. The laboratory report numbers included on the diskette are:

9510085B

The samples included are:

Client Sample ID

TIN-024

TEN-025

Method Spike

Lab Blank

Lab Sample ID

9510085B-01A

9510085B-02A

9510085B-03A

9510085B-04A

This diskette was created in MS Excel 5.0 and saved in a comma delimited format.

If you have any questions regarding this diskette, please feel free to contact me at 1-800-985-5955.

Sincerely,



C. Craig Crume
Vice President, Marketing
Air Toxics Ltd.

10/26/95
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No qual.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510085B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 10/9/95

DATE COMPLETED: 10/27/95

INVOICE # 8458

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-024	Mod. Method 18	2.5 "Hg	\$50.00
02A	TEN-025	Mod. Method 18	2.5 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

CERTIFIED BY:



Laboratory Director

DATE:

10/27/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

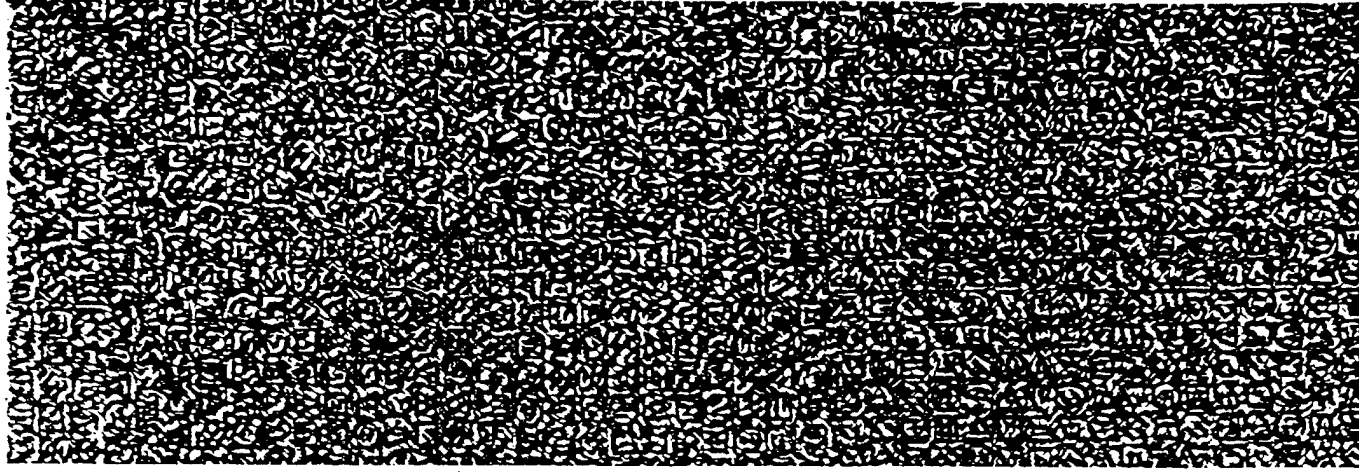
AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-024	9510085B-01A	A101103	10/6/95	Vinyl Chloride	1.5	75	2300
TEN-025	9510085B-02A	A101104	10/6/95	Vinyl Chloride	1.5	75	620
Lab Blank	9510085B-04A	A101102	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							% Recovery
Method Spike	9510085B-03A	A101101	NA	Vinyl Chloride	1.0	50	80

Analysis Date: 10/11/95
 Container Type: 6 Liter Summa Canister
 Analyst's Initials: SPM

Comments: NA = Not Applicable



@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510099A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

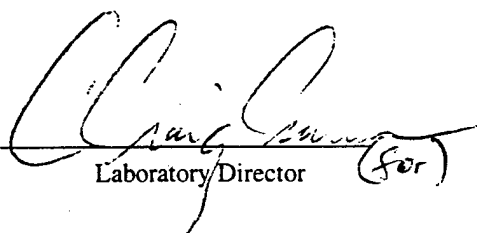
PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/10/95
DATE COMPLETED: 10/20/95

INVOICE # 8358
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-026	TO-14	4.0 "Hg	\$205.00
02A	TEN-027	TO-14	1.0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

10/26/95
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No qual

CERTIFIED BY:


Laboratory Director (for)

DATE:

10/20/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-026

ID#: 9510099A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101105

Date of Collection: 10/10/95

Dil. Factor: 2100

Date of Analysis: 10/11/95

Analyst's Initials: EV

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1100	Not Detected
1,1-Dichloroethene	1100	Not Detected
Freon 113	1100	Not Detected
cis-1,2-Dichloroethene	1100	18000
Chloroform	1100	1600
1,1,1-Trichloroethane	1100	Not Detected
Benzene	1100	2200
Trichloroethene	1100	480000
Toluene	1100	Not Detected
Tetrachloroethene	1100	Not Detected
m,p-Xylene	1100	6100
o-Xylene	1100	4800
Acetone	4200	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates

% Recovery

Method Limits

Octafluorotoluene

101

70-130

Toluene-d8

98

70-130

4-Bromofluorobenzene

82

70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-027

ID#: 9510099A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101106 Date of Collection: 10/10/95
Dil. Factor: 2.8 Date of Analysis: 10/11/95
Analyst's Initials: EV

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1.4	Not Detected
1,1-Dichloroethene	1.4	Not Detected
Freon 113	1.4	Not Detected
cis-1,2-Dichloroethene	1.4	Not Detected
Chloroform	1.4	Not Detected
1,1,1-Trichloroethane	1.4	Not Detected
Benzene	1.4	2.0
Trichloroethene	1.4	1.7
Toluene	1.4	4.5
Tetrachloroethene	1.4	Not Detected
m,p-Xylene	1.4	2.6
o-Xylene	1.4	Not Detected
Acetone	5.6	9.6

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	92	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	105	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9510099A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101102

Date of Collection: NA

Dil. Factor: 1.0

Date of Analysis: 10/11/95

Analyst's Initials: EV

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	92
1,1-Dichloroethene	0.50	101
Freon 113	0.50	88
cis-1,2-Dichloroethene	0.50	101
Chloroform	0.50	96
1,1,1-Trichloroethane	0.50	92
Benzene	0.50	95
Trichloroethene	0.50	82
Toluene	0.50	91
Tetrachloroethene	0.50	85
m,p-Xylene	0.50	87
o-Xylene	0.50	86
Acetone	2.0	76

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	99	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	104	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510099A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 5101104

Date of Collection: NA

Dil. Factor: 1.0

Date of Analysis: 10/11/95

Analyst's Initials: MPG

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	92	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	105	70-130

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WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510099B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

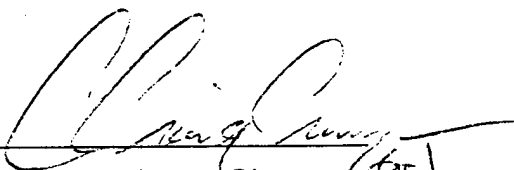
PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/10/95
DATE COMPLETED: 10/20/95

INVOICE # 8358
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-026	Mod. Method 18	4.0 "Hg	\$50.00
02A	TEN-027	Mod. Method 18	1.0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/26/95
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No qual

CERTIFIED BY:


Laboratory Director

DATE:

10/20/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-026	9510099B-01A	A101105	10/10/95	Vinyl Chloride	1.6	80	2600
TEN-027	9510099B-02A	A101106	10/10/95	Vinyl Chloride	1.4	70	Not Detected
Lab Blank	9510099B-04A	A101102	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9510099B-03A	A101101	NA	Vinyl Chloride	1.0	50	% Recovery 80

Analysis Date: 10/11/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: SPM

Comments: NA = Not Applicable

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510133A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

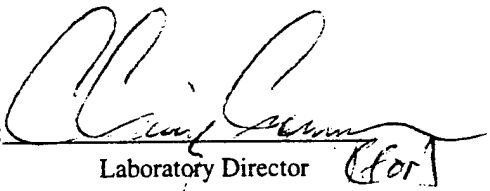
PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/12/95
DATE COMPLETED: 10/20/95

INVOICE # 8359
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$410.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-028	TO-14	2.0 "Hg	\$205.00
02A	TEN-029	TO-14	3.0 "Hg	\$205.00
03A	Method Spike	TO-14	NA	NC
04A	Lab Blank	TO-14	NA	NC

10/26/95
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CERTIFIED BY:


Laboratory Director

DATE:

10/20/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-028

ID#: 9510133A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101309

Date of Collection: 10/11/95

Dil. Factor: 2400

Date of Analysis: 10/13/95

Analyst's Initials: EV

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1200	Not Detected
1,1-Dichloroethene	1200	Not Detected
Freon 113	1200	Not Detected
cis-1,2-Dichloroethene	1200	17000
Chloroform	1200	1600
1,1,1-Trichloroethane	1200	Not Detected
Benzene	1200	2000
Trichloroethene	1200	500000 E
Toluene	1200	Not Detected
Tetrachloroethene	1200	Not Detected
m,p-Xylene	1200	6700
o-Xylene	1200	5800
Acetone	4800	Not Detected

E = Exceeds instrument calibration range, but within linear range.

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	116	70-130
Toluene-d8	115	70-130
4-Bromofluorobenzene	112	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-029

ID#: 9510133A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101310 Date of Collection: 10/11/95
Dil. Factor: 1.8 Date of Analysis: 10/13/95
Analyst's Initials: EV

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.90	Not Detected
1,1-Dichloroethene	0.90	Not Detected
Freon 113	0.90	Not Detected
cis-1,2-Dichloroethene	0.90	Not Detected
Chloroform	0.90	Not Detected
1,1,1-Trichloroethane	0.90	Not Detected
Benzene	0.90	Not Detected
Trichloroethene	0.90	Not Detected
Toluene	0.90	Not Detected
Tetrachloroethene	0.90	Not Detected
m,p-Xylene	0.90	Not Detected
o-Xylene	0.90	Not Detected
Acetone	3.6	7.9

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	92	70-130
Toluene-d8	109	70-130
4-Bromofluorobenzene	118	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9510133A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101305

Date of Collection: NA

Dil. Factor: 1.0

Date of Analysis: 10/13/95

Analyst's Initials: LTS

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	103
1,1-Dichloroethene	0.50	95
Freon 113	0.50	107
cis-1,2-Dichloroethene	0.50	96
Chloroform	0.50	105
1,1,1-Trichloroethane	0.50	110
Benzene	0.50	106
Trichloroethene	0.50	96
Toluene	0.50	100
Tetrachloroethene	0.50	103
m,p-Xylene	0.50	92
o-Xylene	0.50	96
Acetone	2.0	76

Container Type: NA

<u>Surrogates</u>	<u>% Recovery</u>	<u>Method Limits</u>
Octafluorotoluene	113	70-130
Toluene-d8	114	70-130
4-Bromofluorobenzene	113	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510133A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101308 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 10/13/95
Analyst's Initials: LTS

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	126	70-130
Toluene-d8	118	70-130
4-Bromofluorobenzene	118	70-130

10389 ROCKINGHAM ROAD, SACRAMENTO, CA 95827
(916) 362-5332

**USE A BALLPOINT PEN AND PRESS FIRMLY
THE INSTRUCTIONS FOR FILLING OUT
THIS FORM ARE ON THE BACK**

9510133 A

1138

[illegible]

WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510133B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 10/12/95

DATE COMPLETED: 10/20/95

INVOICE # 8359

SUBCONTRACT # 259699

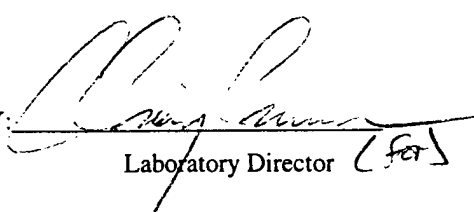
PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNTS: \$100.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-028	Mod. Method 18	2.0 "Hg	\$50.00
02A	TEN-029	Mod. Method 18	3.0 "Hg	\$50.00
03A	Method Spike	Mod. Method 18	NA	NC
04A	Lab Blank	Mod. Method 18	NA	NC

10/26/95
No qual

CERTIFIED BY:


Laboratory Director (for)

DATE:

10/20/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)
TIN-028	9510133B-01A	A101304	10/11/95	Vinyl Chloride	1.4	70	2500
TEN-029	9510133B-02A	A101303	10/11/95	Vinyl Chloride	1.5	75	Not Detected
Lab Blank	9510133B-04A	A101302	NA	Vinyl Chloride	1.0	50	Not Detected
Spiked Sample							
Method Spike	9510133B-03A	A101301	NA	Vinyl Chloride	1.0	50	% Recovery 86

Analysis Date: 10/13/95
Container Type: 6 Liter Summa Canister
Analyst's Initials: JS

Comments: NA = Not Applicable

1138

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Temp. 71.5

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510149B

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

PHONE: 916-362-5332

FAX: 916-362-2318

DATE RECEIVED: 10/13/95

DATE COMPLETED: 10/20/95

INVOICE # 8355

SUBCONTRACT # 259699

PROJECT # 269-104-18-02 McClellan Thermatrix

AMOUNT\$: \$200.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-030	Mod. Method 18	3.5 "Hg	\$50.00
01B	TIN-030 Duplicate	Mod. Method 18	3.5 "Hg	\$50.00
02A	TEN-031	Mod. Method 18	2.5 "Hg	\$50.00
03A	TEX-032	Mod. Method 18	1.5 "Hg	\$50.00
04A	Method Spike	Mod. Method 18	NA	NC
05A	Lab Blank	Mod. Method 18	NA	NC

10/26/95
Z
NO qual

CERTIFIED BY:


Laboratory Director (for)

DATE:

10/20/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

Vinyl Chloride by Modified EPA Method 18 Pre-Fractionator GC/PID

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Dilution Factor	Det. Limit (ppbv)	Amount (ppbv)	RPD
TIN-030	9510149B-01A	A101703	10/13/95	Vinyl Chloride	1.5	75	2600	NA
TIN-030 Duplicate	9510149B-01B	A101704	10/13/95	Vinyl Chloride	1.5	75	2400	8.0
TEN-031	9510149B-02A	A101705	10/13/95	Vinyl Chloride	1.5	75	Not Detected	NA
TEX-032	9510149B-03A	A101706	10/13/95	Vinyl Chloride	1.4	70	Not Detected	NA
Lab Blank	9510149B-05A	A101702	NA	Vinyl Chloride	1.0	50	Not Detected	NA
Spiked Sample							% Recovery	
Method Spike	9510149B-04A	A101701	NA	Vinyl Chloride	1.0	50	80	NA

Analysis Date: 10/17/95

Container Type: 6 Liter Summa Canister

Analyst's Initials: JS

Comments: NA = Not Applicable

RADIANT CORPORATION

10389 ROCKINGHAM ROAD, SACRAMENTO, CA 95827
(916) 362-5332

A high-contrast, black and white image showing a dense, repeating pattern of small, stylized, interlocking shapes, resembling a woven fabric or a complex geometric tessellation. The pattern is composed of numerous small, irregular, and somewhat organic shapes that fit together to form a larger, more regular grid-like structure. The overall effect is one of a complex, textured surface, possibly a microscopic view of a material or a highly detailed textile.

CONTRACT NAME: 0001	0001
0001	0001

CHARGE NUMBER: 11074 1002

✓

Temp. HW2525

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9510149A

Work Order Summary

CLIENT: Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Road
Sacramento, CA 95827

BILL TO: Subcontracts Payable
Radian Corporation
P.O. Box 201088
Austin, TX 78720-1088

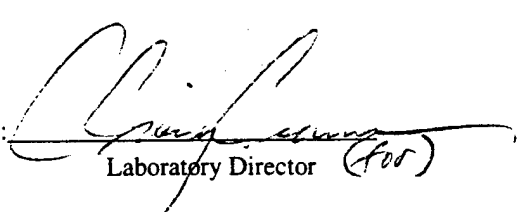
PHONE: 916-362-5332
FAX: 916-362-2318
DATE RECEIVED: 10/13/95
DATE COMPLETED: 10/20/95

INVOICE # 8355
SUBCONTRACT # 259699
PROJECT # 269-104-18-02 McClellan Thermatrix
AMOUNT\$: \$820.00

<u>FRACTION #</u>	<u>NAME</u>	<u>TEST</u>	<u>RECEIPT</u> <u>VAC./PRES.</u>	<u>PRICE</u>
01A	TIN-030	TO-14	3.5 "Hg	\$205.00
01B	TIN-030 Duplicate	TO-14	3.5 "Hg	\$205.00
02A	TEN-031	TO-14	2.5 "Hg	\$205.00
03A	TEX-032	TO-14	1.5 "Hg	\$205.00
04A	Method Spike	TO-14	NA	NC
05A	Lab Blank	TO-14	NA	NC

10/26/95
Z
No qual

CERTIFIED BY:


Laboratory Director (for)

DATE:

10/20/95

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: TIN-030

ID#: 9510149A-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101608

Date of Collection: 10/13/95

Dil. Factor: 3800

Date of Analysis: 10/16/95

Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	1900	Not Detected
1,1-Dichloroethene	1900	Not Detected
Freon 113	1900	Not Detected
cis-1,2-Dichloroethene	1900	19000
Chloroform	1900	Not Detected
1,1,1-Trichloroethane	1900	Not Detected
Benzene	1900	2600
Trichloroethene	1900	600000
Toluene	1900	Not Detected
Tetrachloroethene	1900	Not Detected
m,p-Xylene	1900	7900
o-Xylene	1900	6400
Acetone	7600	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	116	70-130
Toluene-d8	114	70-130
4-Bromofluorobenzene	117	70-130

AIR TOXICS LTD.

SAMPLE NAME: TIN-030 Duplicate

ID#: 9510149A-01B

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101611
Dil. Factor: 3800
Analyst's Initials: MPG

Date of Collection: 10/13/95
Date of Analysis: 10/16/95

Compound	Det. Limit (ppbv)	Amount (ppbv)	RPD
Vinyl Chloride	1900	Not Detected	NA
1,1-Dichloroethene	1900	Not Detected	NA
Freon 113	1900	Not Detected	NA
cis-1,2-Dichloroethene	1900	17000	11
Chloroform	1900	Not Detected	NA
1,1,1-Trichloroethane	1900	Not Detected	NA
Benzene	1900	2300	12
Trichloroethene	1900	590000	1.7
Toluene	1900	Not Detected	NA
Tetrachloroethene	1900	Not Detected	NA
m,p-Xylene	1900	8200	3.7
o-Xylene	1900	6500	1.6
Acetone	7600	Not Detected	NA

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	115	70-130
Toluene-d8	117	70-130
4-Bromofluorobenzene	120	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEN-031

ID#: 9510149A-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101609 Date of Collection: 10/13/95
Dil. Factor: 4.2 Date of Analysis: 10/16/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	2.1	Not Detected
1,1-Dichloroethene	2.1	Not Detected
Freon 113	2.1	Not Detected
cis-1,2-Dichloroethene	2.1	Not Detected
Chloroform	2.1	Not Detected
1,1,1-Trichloroethane	2.1	Not Detected
Benzene	2.1	Not Detected
Trichloroethene	2.1	Not Detected
Toluene	2.1	Not Detected
Tetrachloroethene	2.1	Not Detected
m,p-Xylene	2.1	Not Detected
o-Xylene	2.1	Not Detected
Acetone	8.4	16

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	88	70-130
Toluene-d8	111	70-130
4-Bromofluorobenzene	117	70-130

AIR TOXICS LTD.

SAMPLE NAME: TEX-032

ID#: 9510149A-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101610 Date of Collection: 10/13/95
Dil. Factor: 5.0 Date of Analysis: 10/16/95
Analyst's Initials: MPG

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	2.5	Not Detected
1,1-Dichloroethene	2.5	Not Detected
Freon 113	2.5	Not Detected
cis-1,2-Dichloroethene	2.5	Not Detected
Chloroform	2.5	Not Detected
1,1,1-Trichloroethane	2.5	Not Detected
Benzene	2.5	Not Detected
Trichloroethene	2.5	Not Detected
Toluene	2.5	Not Detected
Tetrachloroethene	2.5	Not Detected
m,p-Xylene	2.5	Not Detected
o-Xylene	2.5	Not Detected
Acetone	10	13

Container Type: 6 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	112	70-130
4-Bromofluorobenzene	114	70-130

AIR TOXICS LTD.

SAMPLE NAME: Method Spike

ID#: 9510149A-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101603/1101605

Date of Collection: NA

Dil. Factor: 1.0

Date of Analysis: 10/16/95

Analyst's Initials: MH

Compound	Det. Limit (ppbv)	% Recovery
Vinyl Chloride	0.50	97
1,1-Dichloroethene	0.50	104
Freon 113	0.50	113
cis-1,2-Dichloroethene	0.50	100
Chloroform	0.50	110
1,1,1-Trichloroethane	0.50	111
Benzene	0.50	115
Trichloroethene	0.50	108
Toluene	0.50	108
Tetrachloroethene	0.50	108
m,p-Xylene	0.50	81
o-Xylene	0.50	94
Acetone	2.0	129

Container Type: NA

Surrogates

Octafluorotoluene

Toluene-d8

4-Bromofluorobenzene

% Recovery

118 / 113

116 / 116

114 / 116

Method Limits

70-130

70-130

70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9510149A-05A

EPA METHOD TO-14 GC/MS Full Scan

File Name: 1101607 Date of Collection: NA
Dil. Factor: 1.0 Date of Analysis: 10/16/95
Analyst's Initials: MH

Compound	Det. Limit (ppbv)	Amount (ppbv)
Vinyl Chloride	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Benzene	0.50	Not Detected
Trichloroethene	0.50	Not Detected
Toluene	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Acetone	2.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	110	70-130
Toluene-d8	115	70-130
4-Bromofluorobenzene	114	70-130

**RADIAN
CORPORATION**
10389 ROCKINGHAM ROAD, SACRAMENTO, CA 95827
(916) 362-5332

9510149

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WHITE - COORDINATOR / GOLDENROD - PROJECT DIRECTOR / PINK - SAMPLE CONTROL / YELLOW - LABORATORY / BLUE - LABORATORY RECEIPT

RADIAN

**SOURCE TEST REPORT
MAFB Thermatrix Thermal Oxidizer
NMHC, NO_x, CO**

Test Date: September 20, 1995

BEST ENVIRONMENTAL, INC.

15890 Foothill Boulevard
San Leandro, California 94578
(510) 278-4011 FAX (510) 278-4018

September 28, 1995

RADIAN
10395 Old Placerville Road
Sacramento, CA 95827

Attn: Ms. Courtney Morris

Subject: Report on the NO_x, CO and NMHC emissions test conducted on the Thermatrix Thermal Oxidizer serving an experimental soil vapor extraction system.

Test Date: September 20, 1995.

Sampling Location: The source is located at the Groundwater Treatment Plant at McClellan Air Force Base, North Highlands, California. Sampling was conducted at the outlet of the 1-inch exhaust from the Oxidizer.

Sampling Personnel: Sampling was performed by Guy Worthington of BEST ENVIRONMENTAL, INC.

Observing Personnel: Courtney Morris was present during the set-up for the emissions test.

Process Description: The Thermatrix Thermal Oxidizer is used as a control device for volatile organic emissions from underground soil vapors.

Test Program: Testing for non-methane hydrocarbons (NMHC), nitrogen oxides (NO_x), carbon monoxide (CO), oxygen (O₂) and carbon dioxide (CO₂) was performed to determine the Oxidizer emissions. Three consecutive 40-minute duration test runs were performed with calibrations before and following each run.

The stack gas volumetric flowrate and moisture content was measured at the outlet using CARB Method 2A and 4. A stainless steel/glass, corrosive resistant, high flow rotometer was used at the exhaust location to determine the exhaust flowrate. Corrections were made for temperature and moisture when calculating the standard dry cubic feet per minute (SDCFM).

Sampling and Analysis Methods: The following California Air Resources Board (CARB) sampling and analytical methods were used:

CARB Method 100
CARB Method 4
CARB Method 2A

NMHC, NO_x, CO, O₂, CO₂ continuous monitoring
Moisture Determination
Volumetric Flowrate (Rotometer)

Instrumentation: The following continuous emission analyzers were used:

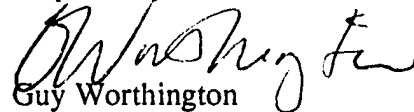
THC/CH ₄	Ratfish Model RS55 FID Total Hydrocarbon Analyzer
CO	TECO Model 48 GFC Carbon Monoxide Analyzer
NO _x	Beckman Model 951 Chemiluminescent NO/NO ₂ /NO _x Analyzer
CO ₂	Horiba PIR-2000 Infrared CO ₂ Analyzer
O ₂	Teledyne Model 326RAX Oxygen Analyzer

Test Results: Emission results for the Oxidizer are presented in Table 1. Conditions during Run #3 appeared to change. The NO_x Analyzer also experienced contamination of some sort at this point and drifted significantly. Post-test calibrations of the NO_x analyzer showed that the contamination was slow to clear from the equipment, and consequently no corrections were made to the NO_x data from Run #3.

All supporting documentation; stack gas volumetric flowrate and moisture calculations, field data sheets, strip chart records, emission calculations, equipment calibrations and calibration gas certifications are appended to this report.

If you have any questions regarding this report, or if BEST ENVIRONMENTAL, INC., can be of any further assistance, please call.

Prepared by



Guy Worthington
Sr. Project Manager

Reviewed by



Dan Cartner
Manager

TABLE 1

RADIAN – McClellan Air Force Base
Thermatrix Soil Vapor Oxidizer

RUN #	1	2	3	AVERAGE	LIMITS
TEST DATE	9-20-95	9-20-95	9-20-95		
TEST LOCATION	OUTLET	OUTLET	OUTLET		
TEST TIME	1106-1146	1156-1236	1250-1330		
FUEL	Nat. Gas	Nat. Gas	Nat. Gas		
FLOWRATE, DSCFM	2.93	2.93	2.93	2.93	
H ₂ O, %	8.0	8.0	8.0	8.0	
O ₂ , %	6.80	6.60	7.90	7.10	
CO ₂ , %	10.0	10.0	9.2	9.7	
NOx, ppm	1.9	1.8	1.4	1.7	
NOx, g/hr	0.0181	0.0171	0.0133	0.0162	
CO, ppm	< 1.0	< 1.0	< 1.0	< 1.0	
CO, g/hr	< 0.0058	< 0.0058	< 0.0058	< 0.0058	
THC, ppm	1.6	1.6	3.8	2.3	
CH ₄ , ppm	2.0	1.0	3.0	2.0	
TNMHC, ppm	< 1.0	< 1.0	< 1.0	< 1.0	
TNMHC, g/hr	< 0.0033	< 0.0033	< 0.0033	< 0.0033	

WHERE,

CO = Carbon Monoxide (M.W. = 28)

NOx = Oxides of Nitrogen (M.W. = 46)

TNMHC = Tot. Non-Methane Hydrocarbons @CH₄ (M.W. = 16)

ppm = Parts Per Million Concentration

g/hr = Grams Per Hour Emission Rate

DSCFM = Standard Dry Cubic Feet Per Minute

Tstd = Std. Temp. °R : 528

CALCULATIONS,

$$\text{g/hr} = 453.6 * \text{PPM} * \text{M.W.} * \text{DSCFM} * 8.22\text{E}-5 / \text{Tstd}$$

RADIAN,

**SOURCE TEST REPORT
MAFB Thermatrix Thermal Oxidizer
THC, NO_x, CO**

Test Date: October 11, 1995

BEST ENVIRONMENTAL, INC.

15890 Foothill Boulevard
San Leandro, California 94578

(510) 278-4011 FAX (510) 278-4018

October 25, 1995

RADIAN

10395 Old Placerville Road
Sacramento, CA 95827

Attn: Ms. Courtney Morris

Subject: Report on the NO_x, CO and THC emissions test conducted on the Thermatrix Thermal Oxidizer serving an experimental soil vapor extraction system.

Test Date: October 11, 1995.

Sampling Location: The source is located at the Groundwater Treatment Plant at McClellan Air Force Base, North Highlands, California. Sampling was conducted at the outlet of the 1.5 to 2 inch diameter pipe exhaust from the Oxidizer.

Sampling Personnel: Sampling was performed by Guy Worthington of BEST ENVIRONMENTAL, INC.

Observing Personnel: Stuart Freeman of RADIAN was onsite during a portion of the test.

Process Description: The Thermatrix Thermal Oxidizer is used as a control device for volatile organic emissions from underground soil vapors.

Test Program: Testing for total hydrocarbons (THC), nitrogen oxides (NO_x), carbon monoxide (CO), oxygen (O₂) and carbon dioxide (CO₂) was performed to determine the Oxidizer emissions. Three consecutive 40-minute duration test runs were performed with calibrations before and following each run.

The stack gas volumetric flow rate and moisture content was measured at the outlet using CARB Method 2A and 4. A stainless steel/glass, corrosive resistant, high flow rotometer was used at the exhaust location to determine the exhaust flow rate. Corrections were made for temperature and moisture when calculating the standard dry cubic feet per minute (SDCFM).

Sampling and Analysis Methods: The following California Air Resources Board (CARB) sampling and analytical methods were used:

CARB Method 100
CARB Method 4
CARB Method 2A

THC, NO_x, CO, O₂, CO₂ continuous monitoring
Moisture Determination
Volumetric Flow Rate (Rotometer)

Instrumentation: The following continuous emission analyzers were used:

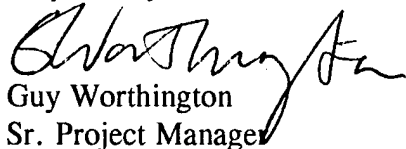
THC	TECO Model 51 FID Total Hydrocarbon Analyzer
CO	TECO Model 48 GFC Carbon Monoxide Analyzer
NOx	TECO Model 10 Chemiluminescent NO/NO ₂ /NOx Analyzer
CO ₂	Horiba PIR-2000 Infrared CO ₂ Analyzer
O ₂	Infrared Model 2200 Fuel Cell Oxygen Analyzer

Test Results: Emission results for the Oxidizer are presented in Table 1. Carbon monoxide emissions registered negative emission concentrations, which can be attributed to a negative interference from CO₂ in the process exhaust. Historical interference checks have shown -0.5 ppm bias in the presence of 10% CO₂. Since the total hydrocarbons were negligible, the CO emissions are most likely also negligible.

All supporting documentation; stack gas volumetric flow rate and moisture calculations, field data sheets, strip chart records, emission calculations, equipment calibrations and calibration gas certifications are appended to this report.

If you have any questions regarding this report, or if BEST ENVIRONMENTAL, INC., can be of any further assistance, please call.

Prepared by


Guy Worthington
Sr. Project Manager

Reviewed by



for Regan Best
Manager

TABLE 1

**RADIAN – McClellan Air Force Base
Thermatrix Soil Vapor Oxidizer**

RUN #	1	2	3	AVERAGE	LIMITS
TEST DATE	10-11-95	10-11-95	10-11-95		
TEST LOCATION	OUTLET	OUTLET	OUTLET		
TEST TIME	1212-1252	1305-1345	1355-1435		
FUEL	Nat. Gas	Nat. Gas	Nat. Gas		
FLOWRATE, DSCFM	2.93	2.93	2.93	2.93	
H ₂ O, %	8.97	8.97	8.97	9.0	
O ₂ , %	9.30	9.80	10.30	9.80	
CO ₂ , %	9.6	9.3	9.2	9.4	
NO _x , ppm	0.8	1.0	0.7	0.8	
NO _x , g/hr	0.0076	0.0095	0.0067	0.0079	
CO, ppm	< 0.5	< 0.5	< 0.5	< 0.5	
CO, g/hr	< 0.0029	< 0.0029	< 0.0029	< 0.0029	
THC, ppm	0.1	0.8	1.0	0.6	
CH ₄ , ppm	N.M.	N.M.	N.M.	N.M.	
THC, g/hr	0.0003	0.0026	0.0033	0.0021	

WHERE,

CO = Carbon Monoxide (M.W. = 28)

NO_x = Oxides of Nitrogen (M.W. = 46)THC = Total Hydrocarbons @CH₄ (M.W. = 16)

ppm = Parts Per Million Concentration

g/hr = Grams Per Hour Emission Rate

DSCFM = Standard Dry Cubic Feet Per Minute

N.M. = Not Measured

Tstd = Std. Temp. °R : 528

CALCULATIONS,

$$\text{g/hr} = 453.6 * \text{PPM} * \text{M.W.} * \text{DSCFM} * 8.22\text{E}-5 / \text{Tstd}$$

TECHNICAL MEMORANDUM

TO: Courtney Morris ✓

FROM: Judy Nottoli *JN*

COPY: Lisa LaFe, Rich Howell

DATE: November 8, 1995

SUBJECT: Source Testing Results of the Thermatrix Flameless Thermal Oxidation System

Description of the Test Program

Hydrogen chloride (HCl) emission testing was performed by Radian on the Thermatrix Flameless Thermal Oxidation System at McClellan Air Force Base (AFB). HCl is generated by the Thermatrix System when chlorinated VOCs (e.g., trichloroethene [TCE]) in the soil vapor extraction (SVE) offgas are oxidized and the chlorine is converted to HCl. The purpose of this sampling effort was to determine HCl emissions from the system while it was treating SVE offgas. The allowable HCl emission limit for this source is 0.6 lb/hr, as per the Sacramento Metropolitan Air Quality Management District (SMAQMD).

Radian Corporation performed the testing on two different days, September 22 (Week 1 of the treatability test) and October 6, 1995 (Week 3). Three sampling runs and a field blank were collected during each of the two sampling events. During the first sampling event on September 22, 1995, the Radian sampling team (Lisa LaFe and Rich Howell) arrived at the site and set up the testing equipment. Sampling was initiated at 08:36 and was completed at 12:48. No sampling problems were encountered. However, significant corrosion of the exhaust stack was noted. Following the first sampling event, the 1-inch diameter exhaust stack was replaced with a 1.5-inch diameter stack.

On October 5, 1995, the day before the second sampling event, the Thermatrix system was off-line due to a power outage. The system operated on the same electrical circuit as a near-by catalytic oxidation (Catox) unit, which tripped the circuit breaker. On October 6, the Thermatrix unit was restarted at 09:00 and ambient air was passed through the system. At 13:30, SVE offgas was introduced to the system. At 15:00, the Thermatrix system shut down again due to the Catox power problem. The power supply configuration for the Thermatrix was then revised (i.e., an independent circuit was used) and the system was restarted. Sampling was initiated once the system's oxidation temperature reached 1600 °F. Lisa LaFe and Stuart Freeman of Radian Corporation performed three HCl emission tests between 15:35 and 18:00.

Courtney Morris
November 8, 1995
Page 2

HCl emissions from the Thermatrix system were measured according to California Air Resources Board (CARB) Method 421. Exhaust gas was drawn from the stack through a series of four impingers. The first two impingers contained 100 milliliters of sodium carbonate buffer solution, the third impinger was empty, and the fourth impinger contained approximately 200 grams of silica gel. Following sample collection, the sodium carbonate solution was recovered from the impingers and analyzed for the chloride anion using ion chromatography coupled with a conductivity detector. The samples were analyzed by Radian's analytical laboratory in Summit Park, Texas according to California Air Resource Board (CARB) Method 421.

Samples were collected anisokinetically at a single point in the exhaust stack. This was not expected to have affected the test results because particulate emissions from the unit are negligible and no droplets were present in the gas stream. Multiple point sampling was not feasible because of the relatively small stack diameter.

Stack gas velocity and moisture content were determined during each test run. Velocity was determined using a pitot tube/manometer/thermocouple assembly. Oxygen and carbon dioxide concentrations were determined with a Fyrite apparatus. Moisture content was determined based on the impinger weight gain and volume of gas sampled.

Test Results

Results of the emission testing are summarized in Table 1. Supporting calculations and field data sheets are presented in Attachment A; laboratory data and chain-of-custody forms are presented in Attachment B; equipment calibration data are included in Attachment C.

HCl emissions ranged from 0.083 to 0.096 lb/hr, and averaged 0.092 lb/hr during Sampling Event 1 (i.e., September 22). Lower emissions were observed during Sampling Event 2 (i.e., October 6), ranging from 0.041 to 0.051 lb/hr and averaging 0.045 lb/hr. Emissions were well below the 0.6 lb/hr SMAQMD limit during both sampling events. HCl concentrations in the exhaust gas decreased slightly from 107 mg/dscf (3-test average) during Sampling Event 1 to 83 mg/dscf during Sampling Event 2.

Emissions were relatively consistent during Event 1; more variability was observed during the Event 2 tests, as emissions increased from Test 1 (0.041 lb/hr) to Test 3 (0.051 lb/hr). This may be related to the Thermatrix system outage that occurred prior to the Event 2 tests. Note that the Test 3 HCl exhaust gas concentration (99 mg/dscf) is comparable to the Event 1 exhaust gas concentrations.

Courtney Morris
November 8, 1995
Page 3

Exhaust gas flow rates decreased from 6.5 dscfm during Sampling Event 1 to 4.1 dscfm during Event 2; the exhaust gas temperature similarly decreased from 234°F (Event 1) to 121°F (Event 2). Stack gas characteristics (i.e., moisture content; O₂ and CO₂ concentrations) were comparable during the two test events.

Review of the quality assurance/quality control (QA/QC) data presented in Attachments A through C reveals that the quality of the data was acceptable. Specifically, sampling train leak checks, sampling conditions, and equipment calibrations were within method-specified limits. Similarly, the analytical QA/QC data were acceptable. Results of the duplicate, spike and blank sample analyses are presented in Attachment B.

Table 1
Source Testing Parameters and Hydrogen Chloride Emission Data

Parameter	Units	Sampling Event 1 (9/22/95)				Sampling Event 2 (10/6/95)			
		Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Run time	NA	0836-0941	1029-1129	1148-1248		1535-1605	1640-1710	1730-1800	
Sample volume	dscf	27.85	28.39	27.98	28.07	13.86	14.15	14.19	14.07
Stack gas velocity	ft/sec	26.8	30.1	28.1	28.3	7.0	6.7	6.4	6.7
Volumetric flow rate	dscfm	6.3	6.9	6.4	6.5	4.3	4.1	3.9	4.1
Stack gas temperature	°F	230	237	235	234	120	120	122	121
Stack gas moisture	%	6.8	7.5	8.2	7.5	7.3	8.1	7.4	7.6
CO ₂	%	7.2	7.2	7.2	7.2	8.0	8.0	8.0	8.0
O ₂	%	6.8	6.8	6.8	6.8	9.0	9.0	9.0	9.0
HCl concentration	mg/dscf	100	108	113	107	72	79	99	83
HCl emission rate	lb/hr	0.083	0.098	0.096	0.092	0.041	0.043	0.051	0.045

NA = not applicable
 dscfm = dry standard cubic feet per minute
 CO₂ = carbon dioxide
 O₂ = oxygen
 ft/sec = feet per second
 mg/dscf = milligrams per dry standard cubic foot
 lb/hr = pounds per hour

ATTACHMENT A

SUPPORTING CALCULATIONS AND FIELD DATA SHEETS

NOMENCLATURE

acfm	Actual Cubic Feet per Minute
P_{bar}	Barometric Pressure
ft/sec	Feet per Second
g/mole	Grams per Gram-Mole
H_2O	Water Vapor Concentration
ug	Micrograms
lb/hr	Pounds per Hour
kg/hr	Kilograms per Hour
gm/sec	Grams per Second
$\text{N}_2, \text{CO}_2, \text{O}_2$	Nitrogen, Carbon Dioxide, Oxygen Concentration
ppmv	Parts per Million by Volume
ug/dscf	Micrograms per dry standard cubic feet
PTCF	Pitot Tube Calibration Factor
DGMCF	Dry Gas Meter Calibration Factor
dscfm	Standard Cubic Feet per Minute (dry basis)
dscf	Standard Cubic Feet (dry basis)
deg F	Degrees Fahrenheit
cu. ft	Cubic Feet (as measured)
HCl	Hydrochloric acid
ΔP	Velocity Pressure
ΔH	Pressure drop across the orifice meter

Table A-1. Thermatrix: Hydrogen Chloride Emission Data - Sampling Event 1

Run Number		#1	#2	#3	Event 1
Date		09/22/95	09/22/95	09/22/95	
Time		0836-0941	1029-1129	1148-1248	Avg.
DGMCF (---)	=	1.012	1.012	1.012	1.012
Dry Gas Meter Volume (cu. ft.)	=	27.89	29.06	29.00	28.65
PTCF (---)	=	0.99	0.99	0.99	0.99
Barometric Pressure (" Hg)	=	29.90	29.90	29.90	29.90
Impinger Weight Gain (grams)	=	43	49	53	48
Percent Oxygen (% O2)	=	6.8	6.8	6.8	6.8
Percent Carbon Dioxide (% CO2)	=	7.2	7.2	7.2	7.2
Average Delta H (" H2O)	=	0.65	0.80	0.80	0.75
Pressure at Meter (" Hg)	=	29.95	29.96	29.96	29.96
Pressure in Stack (" H2O)	=	0.36	0.34	0.34	0.35
Temp at Meter (deg F)	=	76	88	95	86
Temp in Stack (deg F)	=	230	237	235	234
Sq Rt Stack Gas Vel Press ((a))	=	0.353	0.394	0.367	0.371
Standard Temp (deg F)	=	68.0	68.0	68.0	68.0
Standard Pressure (" Hg)	=	29.92	29.92	29.92	29.92
Diameter of Stack (feet)	=	0.083	0.083	0.083	0.083
Volume of Gas Sampled (dscf)	=	27.85	28.39	27.98	28.08
Moisture Fraction (% H2O)	=	6.8%	7.5%	8.2%	7.5%
Gas Molecular Weight (g/mole)	=	28.64	28.56	28.48	28.56
Stack Gas Velocity (ft/sec)	=	26.8	30.1	28.1	28.3
Volumetric Stack Gas Flow (acfm)	=	8.8	9.8	9.2	9.3
Volumetric Stack Gas Flow (dscfm)	=	6.3	6.9	6.4	6.5

Hydrogen Chloride Emission Data

Quantity Chloride Collected (ug)	2,710,000	2,970,000	3,075,000 b	2,918,333
Quantity HCl Collected (ug)	2,785,880	3,053,160	3,161,100	3,000,047
Concentration (ug/dscf)	100,021	107,531	112,959	106,837
Emission Rate (gm/sec)	0.010	0.012	0.012	0.012
Emission Rate (kg/hr)	0.038	0.044	0.043	0.042
Emission Rate (lb/hr)	0.083	0.098	0.096	0.092

(a) (in.H2O)**0.5

(b) Run 3 represents the average result of duplicate analyses (refer to the laboratory data in Attachment B).

Table A-2. Thermatrix: Hydrogen Chloride Emission Data - Sampling Event 2

Run Number		#1	#2	#3	Event 2
Date		10/06/95	10/06/95	10/06/95	
Time		1535-1605	1640-1710	1730-1800	Avg.
DGMCF	(---)=	0.998	0.998	0.998	0.998
Dry Gas Meter Volume	(cu. ft.)=	14.49	14.69	14.70	14.62
PTCF	(---)=	0.99	0.99	0.99	0.99
Barometric Pressure	(" Hg)=	29.81	29.81	29.81	29.81
Impinger Weight Gain	(grams)=	23	27	24	25
Percent Oxygen	(% O ₂)=	9.0	9.0	9.0	9.0
Percent Carbon Dioxide	(% CO ₂)=	8.0	8.0	8.0	8.0
Average Delta H	(" H ₂ O)=	0.80	0.80	0.80	0.80
Pressure at Meter	(" Hg)=	29.87	29.87	29.87	29.87
Pressure in Stack	(" H ₂ O)=	0.03	0.01	0.01	0.01
Temp at Meter	(deg F)=	90	86	85	87
Temp in Stack	(deg F)=	120	120	122	121
Sq Rt Stack Gas Vel Press	((a))=	0.100	0.096	0.091	0.096
Standard Temp	(deg F)=	68.0	68.0	68.0	68.0
Standard Pressure	(" Hg)=	29.92	29.92	29.92	29.92
Diameter of Stack	(feet)=	0.125	0.125	0.125	0.125
Volume of Gas Sampled	(dscf)=	13.86	14.15	14.19	14.07
Moisture Fraction	(% H ₂ O)=	7.3%	8.1%	7.4%	7.6%
Gas Molecular Weight	(g/mole)=	28.80	28.70	28.77	28.76
Stack Gas Velocity	(ft/sec)=	7.0	6.7	6.4	6.7
Volumetric Stack Gas Flow	(acfm)=	5.1	4.9	4.7	4.9
Volumetric Stack Gas Flow	(dscfm)=	4.3	4.1	3.9	4.1

Hydrogen Chloride Emission Data

Quantity Chloride Collected (ug)	968,000	1,090,000	b 1,370,000	1,142,667
Quantity HCl Collected (ug)	995,104	1,120,520	1,408,360	1,174,661
Concentration (mg/dscf)	71,810	79,161	99,232	83,401
Emission Rate (gm/sec)	0.005	0.005	0.006	0.006
Emission Rate (kg/hr)	0.019	0.019	0.023	0.020
Emission Rate (lb/hr)	0.041	0.043	0.051	0.045

(a) (in.H₂O)**0.5

(b) Run 2 represents the average result of duplicate analyses (refer to the laboratory data in Appendix B).

GENERAL COMPUTATION SHEET

 CLIENT NAME _____
 PROJECT NAME Thermatrix

CALCULATION SET		
Prelim.		
Final		
Sheet <u>1</u> Of <u>3</u>		
Charge #		
Rev.	Comp. By	Chk'd By
	<u>7/11</u>	
	Date <u>11/8/95</u>	Date
	Date	Date

Calculation Validation
(Test #2, 9/22/95)

Calculate HCl emissions in mg/dscf and lb/hr given the input data presented in Table A-1:

- ① Calculate the sample gas volume, corrected to ~~std~~ standard conditions, given:

$$\Delta V = 29.06 \text{ ft}^3 \text{ (as measured)}$$

$$\gamma = 1.012$$

$$T_m = 88^\circ\text{F} + 460 = 548^\circ\text{R}$$

$$T_{std} = 528^\circ\text{R}$$

$$P_{std} = 29.92 \text{ in. Hg}$$

$$P_m = P_{bar} + \Delta H / 13.6 = 29.9 + 0.8 / 13.6 = 29.96 \text{ in. Hg.}$$

$$\begin{aligned} \Delta V_{std} &= \Delta V \times \gamma \times \left(\frac{528}{548}\right) \times \left(\frac{29.96}{29.92}\right) \\ &= 29.06 \times 1.012 \left(\frac{528}{548}\right) \left(\frac{29.96}{29.92}\right) = \underline{28.37 \text{ dscf}} \end{aligned}$$

- ② Calculate the stack gas moisture content (B_w), given $V_{LC} = 49 \text{ mls}$

$$\begin{aligned} B_w &= \frac{0.0473 (49)}{[0.0473 (49) + 28.37]} \times 100 \\ &= \underline{7.55\%} \end{aligned}$$

- ③ Calculate stack gas velocity (V_s) and flow, given

$$C_p = 0.99$$

$$\sqrt{\Delta P_V} = 0.394 (\text{in. H}_2\text{O})^{\frac{1}{2}}$$

$$T_s = 237 + 460 = 697^\circ\text{R}$$

GENERAL COMPUTATION SHEET

CLIENT NAME _____

 PROJECT NAME Thermax

CALCULATION SET		
Prelim. _____		
Final _____		
Sheet <u>2</u> Of <u>3</u>		
Charge # _____		
Rev.	Comp. By	Chk'd By
	<u>11/8/95</u>	
	Date	Date
	Date	Date

$$P_s = P_{bar} + P_{stat}/13.6 = 29.90 + 0.34/13.6 = 29.93 \text{ in. Hg}$$

$$M_d = 0.44 \times 2CO_2 + 0.32 \times 2O_2 + 0.28(100 - (2CO_2 + 2CO_2))$$

$$= 0.44 \times 7.2 + 0.32 \times 6.8 + 0.28(86) = 29.42 \text{ lb/lb-mol}$$

$$M_s = 29.42(1 - 0.0755) + 18(0.0755) = 28.56 \text{ lb/lb-mole (wet basis)}$$

$$A_s = \pi \left(\frac{1}{2}\right)^2 / 144 = 5.454 \times 10^{-3} \text{ ft}^2$$

$$V_s = 85.49(C_p)(\sqrt{\Delta P_v}) \left[\frac{T_s}{P_s M_s} \right]^{\frac{1}{2}}$$

$$= 85.49(0.99)(0.394) \left[\frac{697}{(29.93)(28.56)} \right]^{\frac{1}{2}}$$

$$= 30.11 \text{ ft/sec}$$

$$Q_{ACFM} = V_s \times 60 \times A_s$$

$$= 30.11 \times 60 \times (5.454 \times 10^{-3})$$

$$= 9.85 \text{ ACFM}$$

$$Q_{DSCFM} = Q_{ACFM} \times \left(\frac{528}{29.92} \right) \times \frac{P_s}{T_s} \times \left(1 - \frac{B_w}{100} \right)$$

$$= 9.85 \times 528/29.92 \times 29.93/697 \times (0.9245)$$

$$= 6.90 \text{ dscfm}$$

④ Calculate HCl emissions (mg/dscf, lb/hr) given

$$Cl^- = 2,970 \text{ mg}$$

$$HCl = 2,970 \times \frac{36.5}{35.5} = 3,054 \text{ mg}$$

GENERAL COMPUTATION SHEET

 CLIENT NAME _____
 PROJECT NAME Thermatrix

CALCULATION SET		
Prelim.		
Final		
Sheet <u>3</u> Of <u>3</u>		
Charge #		
Rev.	Comp. By	Chk'd By
	<u>7/1/15</u>	
	Date <u>11/2/15</u>	Date
	Date	Date

$$C_{HCl} = HCl, mg / \Delta V_{std}$$

$$= 3,054^{mg} / 28.37 dscf = \underline{\underline{107.6 mg/dscf}}$$

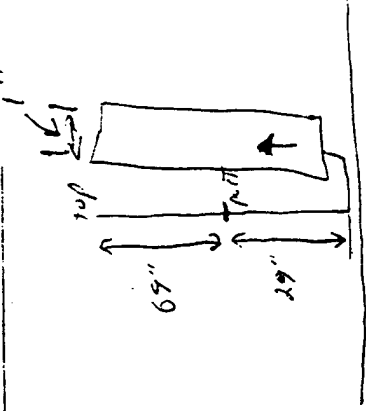
$$HCl \text{ Emissions, lb/hr} = C_{HCl}, mg/dscf \times Q, dscfm \times \frac{1b}{453.6 \times 10^3 mg} \times \frac{60 min}{hr}$$

$$= 107.6 \times 6.9 \times \frac{60}{(453.6 \times 10^3)}$$

$$= \underline{\underline{0.0982 lb/hr}}$$

FIELD DATA SHEETS

PAGE 1 OF 1



PLANT	McClellan	PROBE LENGTH AND TYPE	HEIGHT OF LOCATION (ft)
DATE	9-22-95	NOZZLE I.D. (in)	DUCT DIMENSIONS
SAMPLING LOCATION	Thermatrix	METER BOX NUMBER	FILTER NUMBER
SAMPLE TYPE	HCL	METER & HQ	ASSUMED MOISTURE (%)
RUN NUMBER	1	Yd	MOISTURE METHOD
OPERATOR	BAH L D L	K FACTOR	MOISTURE DATA
AMBIENT TEMPERATURE	75	PROBE HEATER SETTING	O2/CO2 METHOD
BAROMETRIC PRESSURE	29.90	HEATER BOX SETTING	O2
STATIC PRESSURE (Psi)	0.36		CO2
INITIAL LEAKCHECK	0.001 cfm		FINAL LEAKCHECK

READ AND RECORD ALL DATA EVERY 5 MINUTES

[illegible]

COMMENTS: Note: canister sample collected at beginning of run by JAK

Revision: 11/00

PLANT	
DATE	
SAMPLING LOCATION	
SAMPLE TYPE	
RUN NUMBER	
OPERATOR	

[illegible]**COMMENTS:**

Revision: 11/90

11

2-5-149

Revision: 1/190

COMMENTS:

10:56 4 SCFH N.G.
MAG GAUGE 0.25
inlet temp 1560F

PLANT	
DATE	
SAMPLING LOCATION	
SAMPLE TYPE	
RUN NUMBER	
OPERATOR	

[illegible]

COMMENTS:

Revision: 11/90

12:30 0.456h
MAG-Gauge 0.35
Inlet Temp = 170

PLANT	
DATE	
SAMPLING LOCATION	
SAMPLE TYPE	
RUN NUMBER	
OPERATOR	

[illegible]**COMMENTS:**

Revision: 11/90

PLANT	Thermatrix	PROBE LENGTH AND TYPE	HEIGHT OF LOCATION (ft)	3'
DATE	10/6/95	NOZZLE I.D. (in)	DUCT DIMENSIONS	1.5"
SAMPLING LOCATION	0616t	METER BOX NUMBER	FILTER NUMBER	-
SAMPLE TYPE	HCL	METER & HQ	ASSUMED MOISTURE (%)	-
RUN NUMBER	1	Yd	MOISTURE METHOD	imp. org. gas
OPERATOR	SAF/LDL	K FACTOR	MOISTURE DATA	23ml
AMBIENT TEMPERATURE	80°F	PROBE HEATER SETTING	O2/CO2 METHOD	Fluirs
BAROMETRIC PRESSURE	29.81	HEATER BOX SETTING	O2	9%
STATIC PRESSURE (Psi)	0.03		CO2	8%
INITIAL LEAKCHECK	0.005 PD	5 1/4	FINAL LEAKCHECK	0.005 C

READ AND RECORD ALL DATA EVERY 2.5 MINUTES

HEAD AND RECORD ALL DATA EVENT _____ MINUTES											
Traverse Point Number	Sampling Time (min)	Clock Time (24-hr)	Gas Meter Reading (Vn), cu. ft.	Velocity Head (± Ft). W. H ₂ O	Flue Gas Temperature (°F)	Orifice Pressure Differential (± H. in. H ₂ O)	Filter Temperature (°F)	Temperature (°F)			Pump Vacuum (in. Hg)
								Dry Gas Meter		Impinger Exit ±	
								Inlet (Tm in)	Outlet (Tm out)		
1	2.5	1537.5	629.31		120	.85		92	87	95	2
1	5	1540	631.5		120	.80		93	88	89	2
1	7.5	1542.5	632.7		120	.80		92	88	92	2
	10	1545	633.9		120	.80		91	87	91	2
	12.5	1547.5	—		120	.80		90	88	91	2
	15	1550	636.3		120	.80		91	89	91	2
	17.5	1552.5	637.5		120	.80		94	90	91	2
	20	1555	638.6		120	.80		91	89	89	2
	22.5	1557.5	640.0		120	.80		91	89	88	2
	25	1600	641.2		120	.80		91	89	84	2
	27.5	1602.5	—		120	.80		91	86	86	2
	30	1605	643.796		120	.80		91	88	86	2
Ann/Net	30	A-	14,486		120	0.80				89.9	

COMMENTS: *Impinger box iced up. Thermocouple is in direct sun.

Revision: 11/00

PAGE 1 OF 1

5-11-5

READ AND RECORD ALL DATA EVERY 7.5 MINUTES

READ AND RECORD ALL DATA EVERY 2-2 MINUTES											
Traverse Point Number	Sampling Time (min)	Clock Time (24-hr)	Gas Meter Reading (Vn), cu.ft	Velocity Hood (Δ Po), In. H ₂ O	Flue Gas Temperature (°F)	Orifice Pressure Differential (Δ H, In. H ₂ O)	Filter Temperature (°F)	Temperature (°F)			Pump Vacuum (In. Hg)
								Dry Gas Meter		Impinger Exit	
								Inlet (Tm In)	Outlet (Tm Out)		
1	1640	1646	643.94		120	.80	—	85	85	82	2
1	2.5	1642.5	645.23		120	.80		85	86	73	2
1	5.0	1645	646.8		120	.80		85	85	67	2
1	7.5	1647.5	648.0		120	.80		86	85	65	2
	10	1650	649.2		120	.80		86	85	65	2
	12.5	1652.5	—		120	.80		87	86	64	2
	15	1655	651.4		120	.80		87	86	66	2
	17.5	1657.5	652.6		120	.80		87	86	63	2
	20	1700	653.7		120	.80		87	86	63	2
	22.5	1702.5	654.9		120	.80		87	86	63	2
	25	1705	656.1		120	.80		87	85	62	2
	27.5	1707.5	657.4		120	.80		88	85	61	2
	30	1710	658.632		120	.80		88	85	61	2

HYG/NETT

Revision: 11/00

PLANT	Thermatrix	PROBE LENGTH AND TYPE	24" / Teflon	HEIGHT OF LOCATION (ft)	3'
DATE	10/6/95	NOZZLE I.D. (in)	-	DUCT DIMENSIONS	1.5"
SAMPLING LOCATION	OUTLET	METER BOX NUMBER	SAC-01	FILTER NUMBER	-
SAMPLE TYPE	HCL	METER & HQ	1.894	ASSUMED MOISTURE (%)	-
RUN NUMBER	3	Yd	0.798	MOISTURE METHOD	impinger gain
OPERATOR	SAP/LDL	K FACTOR		MOISTURE DATA	24.2 ml
AMBIENT TEMPERATURE	80°	PROBE HEATER SETTING	-	O2/CO2 METHOD	Fyrite
BAROMETRIC PRESSURE	29.81	HEATER BOX SETTING	-	O2	4%
STATIC PRESSURE (Pa)	0.005			CO2	8%
INITIAL LEAKCHECK	17.005 c #148			FINAL LEAKCHECK	0.005 c #148

READ AND RECORD ALL DATA EVERY _____ MINUTES

Traverse Point Number	Sampling Time (min)	Clock Time (24-hr)	Gas Meter Reading (Nm, cu.ft)	Velocity Head (ft., m. H ₂ O)	Flue Gas Temperature (°F)	Orifice - Pressure Differential (± H. in. H ₂ O)	Filter Temperature (°F)	Temperature (°F)			Pump Vacuum (in. Hg)
								Dry Gas Meter		Impinger Exit	
								Inlet (Tm In)	Outlet (Tm out)		
1	2.5	1732.5	658.700	6	122	0.80		85	86	78	2
1	5.0	1735	661.4		122	0.80		85	85	74	2
	7.5	1737.5	662.9		122	0.80		84	83	70	2
	10	1740	—		122	0.80		85	84	66	2
	12.5	1742.5	664.9		122	0.80		85	84	67	2
	15	1745	666.3		122	0.80		86	84	66	2
	17.5	1747.5	—		122	0.80		85	84	67	2
	20	1750	668.3		122	0.80		86	84	67	2
	22.5	1752.5	669.80		122	0.80		86	84	68	2
	25	1755.0	671.2		122	0.80		85	84	67	2
	27.5	1757.5	672.4		122	0.80		85	84	67	2
	30	1800	673.390		122	0.80		86	84	68	2

COMMENTS:

Revision: 11/200

MOISTURE RECOVERY FORM FOR METHOD 4

Plant	McCellen
Date	9-28-95
Sampling Location	Thermator X
Sample Type	LCI
Run Number	1
Sample Box Number	—
Clean-up Person	LDL
Solvent Rinses	carbonate soln
Sample Identification Code	Therm-01
XAD Trap Number	—

Impinger Number	Impinger Solution	Amount of Solution (g)	Impinger Tip Configuration	Impinger Weight (g)		
				Final	Initial	Weight Gain
1	100 carb/ bicarb soln	100 ml	MGS	125	100	25
2	10 carb/ carb soln	100 ml	GS	110	100	10
3	empty	FE —	MGS	0.0	0.0	0
4	Silica Gel	~200 g	MGS	716.3	707.9	8.4
5						
6						
7						

TOTAL WEIGHT GAIN (g)
43.4

Note: Strong HCL smell from sampling port

MOISTURE RECOVERY FORM FOR METHOD 4

Plant	McClellan
Date	9-22-95
Sampling Location	Thermatrix
Sample Type	HCL
Run Number	2
Sample Box Number	-
Clean-up Person	LDL
Solvent Rinses	Carbonate soln
Sample Identification Code	Therm-02
XAD Trap Number	-

Impinger Number	Impinger Solution	Amount of Solution (g)	Impinger Tip Configuration	Impinger Weight (g)		
				Final	Initial	Weight Gain
1	Carbonate soln	100ml	MGS	130	100	30
2	↓	100ml	GS	112ml	100	12
3	Empty	0ml	MGS	0ml	0ml	0
4	Silica Gel	~200g	MGS	665.1	658.3	6.8
5						
6						
7						

TOTAL WEIGHT GAIN (g)
48.8

MOISTURE RECOVERY FORM FOR METHODS 4, 5, 6

Plant	McClellan
Date	9-22-95
Sampling Location	Thermatrix
Sample Type	HCl
Run Number	3
Sample Box Number	-
Clean-up Person	LDL
Solvent Rinses	Carbonate Soln
Sample Identification Code	Therm-03
XAD Trap Number	

Impinger Number	Impinger Solution	Amount of Solution (g)	Impinger Tip Configuration	Impinger Weight (g)		
				Final	Initial	Weight Gain
1	bicarb/ carbonate Soln	100 ml	mgS	136	100	36
2	↓	↓	GS	108	100	8
3	Empty	0	mgS	2	0	2
4	Silica Gel	~200g	mgS	664.4	657.3	7.1
5						
6						
7						

TOTAL WEIGHT GAIN (g)
53.1

MOISTURE RECOVERY FORM FOR METHODS 4, 5, 6

McClellan

Plant	Thermatrix
Date	10-6-95
Sampling Location	Thermatrix
Sample Type	HCL
Run Number	1
Sample Box Number	-
Clean-up Person	LDL
Solvent Rinses	-
Sample Identification Code	Therm-5
XAD Trap Number	-

Impinger Number	Impinger Solution	Amount of Solution (g) ml	Impinger Tip Configuration	Impinger Weight (g) ml		
				Final	Initial	Weight Gain
1	bicarb/ carb soln	100 ml	mgS	119	100 ml	11
2	↓	↓	GS	105	100 ml	5
3	Empty	0	mgS	0	0 ml	0
4	Silica Gel	~200g	mgS	654.90	647.90	7
5						
6						
7						

TOTAL WEIGHT GAIN (g)

23



MOISTURE RECOVERY FORM FOR METHODS 4, 5, 6

Plant	McClellan
Date	10-6-95
Sampling Location	Thermatrix
Sample Type	HCl
Run Number	2
Sample Box Number	-
Clean-up Person	LDL
Solvent Rinses	-
Sample Identification Code	Therm-6
XAD Trap Number	-

Impinger Number	Impinger Solution	Amount of Solution (g)	Impinger Tip Configuration	Impinger Weight (g)		
				Final	Initial	Weight Gain
1	bicarb/ carb soln	100ml	MG5	118	100	18
2	↓	↓	GS	104	100	4
3	Empty	0	MG5	0	0	0
4	Silica Gel	~200g	MG5	632.92	628.46	4.46
5						
6						
7						

TOTAL WEIGHT GAIN (g)

26.5

MOISTURE RECOVERY FORM FOR METHODS 4, 5, 6

Plant	McClellan
Date	10-6-95
Sampling Location	Thermatrix
Sample Type	HCl
Run Number	3
Sample Box Number	-
Clean-up Person	LDL
Solvent Rinses	-
Sample Identification Code	Therm-7
XAD Trap Number	-

Impinger Number	Impinger Solution	Amount of Solution (g)	Impinger Tip Configuration	Impinger Weight (g)		
				Final	Initial	Weight Gain
1	b. carb / carb soln	100ml	m6s	116	100	16
2	↓	↓	GS	104	100	4
3	Empty	0	m6s	0	0	
4	Silica Gel	~200g	m6s	605.04	600.80	4.24
5						
6						
7						

TOTAL WEIGHT GAIN (g)
24.2

ATTACHMENT B

LABORATORY DATA AND CHAIN-OF-CUSTODY FORMS

Sample Identification Legend

The samples are identified as follows:

THERM-01: Test 1 (9/22/95)

THERM-02: Test 2 (9/22/95)

THERM-03: Test 3 (9/22/95)

THERM-04: Field Blank (9/22/95)

THERM-5: Test 1 (10/06/95)

THERM-6: Test 2 (10/06/95)

THERM-7: Test 3 (10/06/95)

THERM-8: Field Blank (10/06/95)

THERM-RB: Reagent Blank

ANALYTICAL RESULTS

FLAG DEFINITIONS

Flag	Definition
< DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

09/28/95 14:17:41

RESULTS SUMMARY

Work Order # 9509449

Method Chloride, by CARB 421

Test Code CLIEWA00

Project Sample ID:	THERM-01	THERM-02	THERM-03	THERM-03
Lab ID:	9509449-01A	9509449-02A	9509449-03A	9509449-06A DUP
File ID:	ICXC0926-40	ICXC0926-41	ICXC0926-42	ICXC0926-43
Date Collected:	09/22/95	09/22/95	09/22/95	09/22/95
Date Prepared:				
Date Analyzed:	09/26/95 11:45:00	09/26/95 11:45:00	09/26/95 11:45:00	09/26/95 11:45:00
Dilution Factor:	2000	2000	2000	2000
Matrix:	Water	Water	Water	Water
Units:	ug/sample	ug/sample	ug/sample	ug/sample
Report as:	received	received	received	received
Column:				
Analyte	Conc. DL	Conc. DL	Conc. DL	Conc. DL
Chloride	2710000 22500	2970000 21900	3090000 20200	3060000 20200

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RESULTS SUMMARY (Cont'd)

Work Order # 9509449

Method Chloride, by CARB 421

Test Code CL1EWA00

Project Sample ID: Lab ID: File ID: Date Collected: Date Prepared: Date Analyzed: Dilution Factor: Matrix: Units: Report as: Column: Analyte	THERM-04 9509449-04A ICXC0926-46 09/22/95 09/26/95 11:45:00 1 Water ug/sample received Conc. DL	THERM-RB 9509449-05A ICXC0926-47 09/22/95 09/26/95 11:45:00 1 Water ug/sample received Conc. DL	Conc. DL ND 7.49 ND 12.7
Chloride			

10/30/95 13:36:10

RESULTS SUMMARY

Work Order # 9510302

Method Chloride, by CARB 421

Test Code CLIEWA00

Project Sample ID:	THERM-5	THERM-6	THERM-6	THERM-7
Lab ID:	9510302-01A	9510302-02A	9510302-03A DUP	9510302-04A
File ID:	ICXC1016-12	ICXC1016-15	ICXC1016-16	ICXC1016-17
Date Collected:	10/06/95	10/06/95	10/06/95	10/06/95
Date Prepared:				
Date Analyzed:	10/16/95 15:00:00	10/16/95 15:00:00	10/16/95 15:00:00	10/16/95 15:00:00
Dilution Factor:	1000	1000	1000	1000
Matrix:	Water	Water	Water	Water
Units:	ug/sample	ug/sample	ug/sample	ug/sample
Report as:	received	received	received	received
Column:				
Analyte	Conc. DL	Conc. DL	Conc. DL	Conc. DL
Chloride	968000 28.8	1070000 28.8	1110000 28.8	1370000 28.8

Method Chloride, by CARB 421
 Test Code CL1EWA00

Project Sample ID:	THERM-8	THERM-RB	THERM-RB
Lab ID:	9510302-05A	9510302-06A	9510302-06A
File ID:	ICXC1016-18	ICXC1016-11	ICXC1016-20
Date Collected:	10/06/95	10/06/95	10/06/95
Date Prepared:			
Date Analyzed:	10/16/95 15:00:00	10/16/95 15:00:00	10/16/95 15:00:00
Dilution Factor:	1	1	1
Matrix:	Water	Water	Water
Units:	ug/sample	ug/sample	ug/sample
Report as:	received	received	received
Column:			
Analyte	Conc.	Conc.	Conc.
	DL	DL	DL
	ND	ND	ND
	0.0288	0.0288	0.0288
Chloride			

SUPPORTING ANALYTICAL DATA (9/22/95 SAMPLES)

FPAS REPORT

TABLE OF CONTENTS

Client THERMATRIX

Facility MCCLELLAN AFB

Client Code THERMATRIX

Certified By *Shirley Spauld*

Date

9/28/95

Report Form	Analytical Batch ID	Pages	
		From	To
Work Order Summary	WLICXC50926114502	1	1
Work Order Comments		2	2
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Protocol Summary for Chloride, by IC EPA300		4	4
Results Summary		5	6
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WORK ORDER SUMMARY

Report LISA LAKE

To 10389 OLD PLACERVILLE ROAD

SACRAMENTO, CA 95827

Attention LISA LAKE

Phone (916) 362-5332

Client Code THERMATRIX

Client THERMATRIX

Facility MCCELLELLAN AFB

Work ID THERMATRIX TREATABIL

Work Order # 9509449

Page 1

RCN 269-104-18-02

Prepared Radian Analytical Services

By 14046 Summit Dr., Bldg. B

P. O. Box 201088

Austin, TX 78720-1088

512/244-0855

CSC JGSANDOVAL

Case # NA

SDG # NA

RAS # 50912AJGS

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Description
THERM-01	01A	CLIEWA00	Chloride, by IC EPA300
THERM-02	02A	CLIEWA00	Chloride, by IC EPA300
THERM-03	03A	CLIEWA00	Chloride, by IC EPA300
THERM-04	04A	CLIEWA00	Chloride, by IC EPA300
THERM-RB	05A	CLIEWA00	Chloride, by IC EPA300
THERM-03	06A DUP	CLIEWA00	Chloride, by IC EPA300
	07A MS	CLIEWA00	Chloride, by IC EPA300
	08A MSD	CLIEWA00	Chloride, by IC EPA300

WORK ORDER COMMENTS

Sample	Volume (mLs)
9509449-01A	390
9509449-02A	380
9509449-03A	350
9509449-04A	260
9509449-05A	440

ANALYTICAL PROTOCOL SUMMARY

Work Order # 9509449

Page 4

Specification # XXIE

Client THERMATRIX
Facility MCCLELLAN AFB
Client Code THERMATRIX
Method Chloride, by IC EPA300

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
THERM-01	9509449-01A	CLTEWA00	NA	WLICXC50926114502
THERM-02	9509449-02A	CLTEWA00	NA	WLICXC50926114502
THERM-03	9509449-03A	CLTEWA00	NA	WLICXC50926114502
THERM-03	9509449-06A	CLTEWA00	NA	WLICXC50926114502
THERM-04	9509449-04A	CLTEWA00	NA	WLICXC50926114502
THERM-RB	9509449-05A	CLTEWA00	NA	WLICXC50926114502

Method Chloride, by IC EPA300

Test Code CLIEWA00

Initial Calibration # NA

Calibration Date

Analysis Start Date/Time 09/26/95 11:45:00

Analysis Stop Date/Time 09/26/95 22:15:00

Instrument ICXC

Analyst MD

Reviewer IDK

Sequence/Analysis Time	Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1 09/26/95 11:45:00		autocal1r	Initial Calibration	ICXC0926-1
2 09/26/95 11:45:00		autocal2r	Initial Calibration	ICXC0926-2
3 09/26/95 11:45:00		autocal3r	Initial Calibration	ICXC0926-3
4 09/26/95 11:45:00		autocal4r	Initial Calibration	ICXC0926-4
5 09/26/95 11:45:00		autocal5r	Initial Calibration	ICXC0926-5
6 09/26/95 11:45:00		autocal6r	Initial Calibration	ICXC0926-6
7 09/26/95 11:45:00		ICV	Continuing Calibration Check	ICXC0926-7
35 09/26/95 11:45:00		CCV	Continuing Calibration Check	ICXC0926-35
36 09/26/95 11:45:00		BLK953935	Laboratory Blank	ICXC0926-36
37 09/26/95 11:45:00		LCS955878	Lab Control Sample	ICXC0926-37
38 09/26/95 11:45:00		LCS955878	Lab Control Sample Dup	ICXC0926-38
39 09/26/95 11:45:00		A950944901A	Sample	ICXC0926-39
40 09/26/95 11:45:00	THERM-01	9509449-01A	Sample	ICXC0926-40
41 09/26/95 11:45:00	THERM-02	9509449-02A	Sample	ICXC0926-41
42 09/26/95 11:45:00	THERM-03	9509449-03A	Sample	ICXC0926-42
43 09/26/95 11:45:00	THERM-03	9509449-06A	Sample Dup	ICXC0926-43
44 09/26/95 11:45:00	THERM-03	9509449-07A	Matrix Spike	ICXC0926-44
45 09/26/95 11:45:00	THERM-03	9509449-08A	Matrix Spike Dup	ICXC0926-45
46 09/26/95 11:45:00	THERM-04	9509449-04A	Sample	ICXC0926-46
47 09/26/95 11:45:00	THERM-RB	9509449-05A	Sample	ICXC0926-47
48 09/26/95 11:45:00		CCV	Continuing Calibration Check	ICXC0926-48

R E S U L T S

Work Order # 9509449

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Digestion Batch #

Analysis Batch # WLICXC50926114502

Project Sample ID THERM-01

Lab Sample ID 9509449-01A

File # ICXC0926-40

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Collected 09/22/95

Date Received 09/23/95

Date Prepared

Date Analyzed 09/26/95 11:45:00

Instrument ICXC

Column

Analyst MD

Reviewer TDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume ____ 1 (mL) Extract/Digestate Volume ____ 390 (mL) Dilution Factor ____ 2000	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS	Measured Concentration ug/sample 2710000	22500	22500

RESULTS

Digestion Batch #

Analysis Batch # WLICXC50926114502

Project Sample ID THERM-02

Lab Sample ID 9509449-02A

File # ICXC0926-41

Method Chloride, by CARB 421

Test Code CLIEVA00

Date Collected 09/22/95

Date Received 09/23/95

Date Prepared

Date Analyzed 09/26/95 11:45:00

Instrument ICXC

Column

Analyst MD

Reviewer TDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (mL) Extract/Digestate Volume 380 (mL) Dilution Factor 2000	Measured Concentration ug/sample	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS	2970000		21900	21900

09/28/95 14:17:41

R E S U L T S

Digestion Batch #

Analysis Batch # WLICXC50926114502

Work Order # 9509449

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Project Sample ID THERM-03

Lab Sample ID 9509449-03A

File # ICXC0926-42

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Collected 09/22/95

Date Received 09/23/95

Date Prepared

Date Analyzed 09/26/95 11:45:00

Instrument ICXC

Column

Analyst MD

Reviewer IDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (mL) Extract/Digestate Volume 350 (mL) Dilution Factor 2000	Measured Concentration ug/sample	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS		3090000	20200	20200

Digestion Batch #

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Analysis Batch # WLICXC50926114502

Project Sample ID THERM-04

Date Collected 09/22/95

Instrument ICXC

Reporting Subset Matrix W

Lab Sample ID 9509449-04A

Date Received 09/23/95

Column

Spikes Subset Report As received

File # ICXC0926-46

Date Prepared

Analyst MD

Specs Subset % Moisture

Method Chloride, by CARB 421

Date Analyzed 09/26/95 11:45:00

Reviewer IDK

Test Code CLIEWA00

Analyte	CAS #	Aliquot Mass/Volume _____ 1 (mL) Extract/Digestate Volume _____ 260 (mL) Dilution Factor _____ 1			Detection Limit ug/sample	Reporting Limit ug/sample
		Measured Concentration ug/sample				
Chloride	NO_CAS	ND			7.49	7.49

09/28/95 14:17:41

R E S U L T S

Work Order # 9509449

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Digestion Batch #

Analysis Batch # WLICXC50926114502

Project Sample ID THERM-RB

Lab Sample ID 9509449-05A

File # ICXC0926-47

Method Chloride, by CARB 421

Test Code CLIEVA00

Date Collected 09/22/95

Date Received 09/23/95

Date Prepared

Date Analyzed 09/26/95 11:45:00

Instrument ICXC

Column

Analyst MD

Reviewer IDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume _____ 1 (mL) Extract/Digestate Volume _____ 440 (mL) Dilution Factor _____ 1		Detection Limit ug/sample	Reporting Limit ug/sample
		Measured Concentration ug/sample			
Chloride	NO_CAS	ND		12.7	12.7

R E S U L T S

Digestion Batch #
Analysis Batch # WLICXC50926114502

Project Sample ID THERM-03
Lab Sample ID 9509449-06A DUP
File # ICXC0926-43
Method Chloride, by CARB 421
Test Code CLIEVA00
Date Collected 09/22/95
Date Received 09/23/95
Date Prepared
Date Analyzed 09/26/95 11:45:00
Instrument ICXC
Column
Analyst MD
Reviewer IDK
Reporting Subset
Spikes Subset
Specs Subset
Matrix W
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (mL) Extract/Digestate Volume 350 (mL) Dilution Factor 2000 Measured Concentration ug/sample	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS	3060000	20200	20200

LABORATORY BLANK INFORMATION

Work Order # 9509449

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Digestion Batch #

Analysis Batch # WLICXC50926114502

Lab Sample ID BLK953935

File # ICXC0926-36

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Prepared

Date Analyzed

09/26/95 11:45:00

Instrument ICXC

Column

Analyst MD

Reviewer IDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 1 (mL)	Detection Limit mg/L	Reporting Limit mg/L
	Extract/Digestate Volume 1 (mL)		
	Dilution Factor 1		
	Measured Conc. mg/L		
Chloride	ND	0.0288	0.0288

Work Order # 9509449

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Analysis Batch # WLICXC50926114502

Matrix	W	
Report As	received	
% Moisture		
Aliquot Mass or Vol		1 (mL)
Extract Mass or Vol		1 (mL)

Date Analyzed 09/26/95 11:45:00

Spikes	Subset	Report	As received

Analyst MD

% Moisture _____

Reviewer TDK

Aliquot Mass or Vol _____ 1 (mL)

[illegible]

Spike Sol'n # B30849P86	Vol. Added 200 μ L	Sample Lab Sample ID 9509449-03A File # ICXC0926-42	Spiked Sample Lab Sample ID 9509449-07A MS File # ICXC0926-44	Spiked Sample Dup Lab Sample ID 9509449-08A MSD File # ICXC0926-45	Recovery Specifi- cation Limits	RPD					
Surrogate Sol'n	Vol. Added	Aliquot Mass/Vol 1 _____ (mL) Extract Mass/Vol 350 _____ (mL) Dil Fact. 2000	Aliquot Mass/Vol 10 _____ (mL) Extract Mass/Vol 350 _____ (mL) Dil Fact. 2000	Aliquot Mass/Vol 10 _____ (mL) Extract Mass/Vol 350 _____ (mL) Dil Fact. 2000							
		Measured Conc. ug/sampl	Measured Conc. ug/sampl	Measured Conc. ug/sampl							
		Spiked Conc. ug/sampl	Spiked Conc. ug/sampl	Spiked Conc. ug/sampl							
		Rec. %	Rec. %	Rec. %							
Chloride	200	3090000	5670000	92 q	2800000	5550000	88 q	95	105	4.4	15

VERIFICATION

Analysis Batch # WLICXC50926114502

Initial Calibration # NA

Lab Sample ID CCV

Date Analyzed 09/26/95 11:45:00

Reporting Subset

Instrument ICXC

File # ICXC0926-48

Spikes Subset

Analyst MD

Method Chloride, by CARB 421

Specs Subset

Reviewer TDK

Test Code CLIEWA00

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Chloride	5.98	6.00	100	90	110

CONTINUING (OR DAILY) CALIBRATION

Work Order # 9509449

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VERIFICATION

Analysis Batch # WLICXC50926114501

Initial Calibration # NA

Lab Sample ID CCV

File # ICXC0926-35

Method Chloride, by IC EPA300

Test Code CLIEWA00

Date Analyzed 09/26/95 11:45:00

Reporting Subset

Spikes Subset

Specs Subset

Instrument ICXC

Analyst MD

Reviewer TDK

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Chloride	6.00	6.00	100	90	110

VERIFICATION

Analysis Batch # WLICXC50926114500

Initial Calibration # NA

Lab Sample ID ICV

File # ICXC0926-7

Method Chloride, by IC EPA300

Test Code CLIEMA00

Date Analyzed 09/26/95 11:45:00

Reporting Subset

Spikes Subset

Specs Subset

Instrument ICXC

Analyst MD

Reviewer IDK

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Chloride	5.99	6.00	100	90	110

09/28/95 14:17:41

SAMPLE DUPLICATES

Work Order # 9509449
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Digestion Batch # _____
Analysis Batch # WLICXC50926114502

Project Sample ID THERM-03 Date Collected 09/22/95 Instrument ICXC Reporting Subset _____ Matrix W
Method Chloride, by CARB 421 Date Received 09/23/95 Column _____ Spikes Subset _____ Report As received
Test Code CLLEVA00 Date Prepared _____ Analyst MD Specs Subset _____
Date Analyzed 09/26/95 11:45:00 Reviewer TDK

Analyte	Sample Lab Sample ID <u>9509449-03A</u> Dil Fact. <u>2000</u>	Duplicate Lab Sample ID <u>9509449-06A DUP</u> Dil Fact. <u>2000</u>	RPD	
	Measured Conc. ug/sample 3090000	Measured Conc. ug/sample 3060000	Result	Specification Limit %
Chloride			1.0	20

SUPPORTING ANALYTICAL DATA (10/6/95 SAMPLES)

FPAS REPORT

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Client THERMATRIX

Facility MCCLELLAN AFB

Client Code THERMATRIX

Certified By Shirley CarterDate 10/30/95

Report Form	Analytical Batch ID	Pages	
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10/30/95 13:36:10

WORK ORDER SUMMARY

Report LISA LAKE
To 10389 OLD PLACERVILLE ROAD
SACRAMENTO, CA 95827
Attention LISA LAKE
Phone (916) 362-5332

Client Code THERMATRIX
Client THERMATRIX
Facility MCCLELLAN AFB
Work ID THERMATRIX TREATABIL

Work Order # 9510302
Page 1

RCN 269-104-18-02

Prepared Radian Analytical Services
By 14046 Summit Dr., Bldg. B
P. O. Box 201088
Austin, TX 78720-1088
512/244-0855
CSC JGSANDOVAL

Case # NA
SDG # NA
RAS # 50912AJGS

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Description
THERM-5	01A	CLIEWA00	Chloride by IC
THERM-6	02A	CLIEWA00	Chloride by IC
	03A DUP	CLIEWA00	Chloride by IC
THERM-7	04A	CLIEWA00	Chloride by IC
THERM-8	05A	CLIEWA00	Chloride by IC
THERM-RB	06A	CLIEWA00	Chloride by IC
THERM-5	07A MS	CLIEWA00	Chloride by IC
	08A MSD	CLIEWA00	Chloride by IC

Client THERMATRIX Specification # CLIEFacility MCCLELLAN AFBClient Code THERMATRIXMethod Chloride by IC

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
THERM-5	9510302-01A	CLIEA00	NA	WLICXC51016150001
THERM-6	9510302-02A	CLIEA00	NA	WLICXC51016150001
THERM-6	9510302-03A	CLIEA00	NA	WLICXC51016150001
THERM-7	9510302-04A	CLIEA00	NA	WLICXC51016150001
THERM-8	9510302-05A	CLIEA00	NA	WLICXC51016150001
THERM-RB	9510302-06A	CLIEA00	NA	WLICXC51016150001
THERM-RB	9510302-06A	CLIEA00	NA	WLICXC51016150001

10/30/95 13:36:10

ANALYSIS BATCH SUMMARY

Work Order # 9510302

Analysis Batch # WLICXC51016150001

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Method Chloride by IC

Instrument ICXC

Test Code CLIEWA00

Analyst MH

Initial Calibration # NA

Reviewer IDK

Calibration Date

Analysis Start Date/Time 10/16/95 15:00:00

Analysis Stop Date/Time 10/16/95 20:00:00

Sequence/Analysis Time	Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1 10/16/95 15:00:00	THERM-RB	autocal1r	Initial Calibration	ICXC1016-1
2 10/16/95 15:00:00		autocal2r	Initial Calibration	ICXC1016-2
3 10/16/95 15:00:00		autocal3r	Initial Calibration	ICXC1016-3
4 10/16/95 15:00:00		autocal4r	Initial Calibration	ICXC1016-4
5 10/16/95 15:00:00		autocal5r	Initial Calibration	ICXC1016-5
6 10/16/95 15:00:00		autocal6r	Initial Calibration	ICXC1016-6
7 10/16/95 15:00:00		ICV	Continuing Calibration Check	ICXC1016-7
8 10/16/95 15:00:00		BLK954402	Laboratory Blank	ICXC1016-8
9 10/16/95 15:00:00		LCS956982	Lab Control Sample	ICXC1016-9
10 10/16/95 15:00:00		LCS0956982	Lab Control Sample Dup	ICXC1016-10
11 10/16/95 15:00:00		9510302-06A	Sample	ICXC1016-11
12 10/16/95 15:00:00		9510302-01A	Sample	ICXC1016-12
13 10/16/95 15:00:00		9510302-07A	Matrix Spike	ICXC1016-13
14 10/16/95 15:00:00		9510302-08A	Matrix Spike Dup	ICXC1016-14
15 10/16/95 15:00:00		9510302-02A	Sample	ICXC1016-15
16 10/16/95 15:00:00		9510302-03A	Sample Dup	ICXC1016-16
17 10/16/95 15:00:00		9510302-04A	Sample	ICXC1016-17
18 10/16/95 15:00:00		9510302-05A	Sample	ICXC1016-18
19 10/16/95 15:00:00		CCV	Continuing Calibration Check	ICXC1016-19
20 10/16/95 15:00:00		9510302-06A	Sample	ICXC1016-20

RESULTS

Work Order # 9510302

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Digestion Batch #

Analysis Batch # WLICXC51016150001

Project Sample ID THERM-5

Lab Sample ID 9510302-01A

File # ICXC1016-12

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Collected 10/06/95

Date Received 10/10/95

Date Prepared

Date Analyzed 10/16/95 15:00:00

Instrument ICXC

Column

Analyst MH

Reviewer IDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume ____ (mL) Extract/Digestate Volume ____ 335 (mL) Dilution Factor ____ 1000		Detection Limit ug/sample	Reporting Limit ug/sample
		Measured Concentration ug/sample			
Chloride	NO_CAS	968000		28.8	28.8

10/30/95 13:36:10

R E S U L T S

Work Order # 9510302

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Digestion Batch #

Analysis Batch # WLICXC51016150001

Project Sample ID THERM-6

Lab Sample ID 9510302-02A

File # ICXC1016-15

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Collected 10/06/95

Date Received 10/10/95

Date Prepared

Date Analyzed 10/16/95 15:00:00

Instrument ICXC

Column

Analyst MH

Reviewer TDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume (mL) Extract/Digestate Volume 356 (mL) Dilution Factor 1000 Measured Concentration ug/sample	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS	1070000	28.8	28.8

RESULTS

Digestion Batch #

Analysis Batch # WLICXC51016150001

Project Sample ID ITHRM-6
Lab Sample ID 9510302-03A DUP
File # ICXC1016-16
Method Chloride, by CARB 421
Test Code CLIEMA00

Date Collected 10/06/95
Date Received 10/10/95
Date Prepared
Date Analyzed 10/16/95 15:00:00

Instrument ICXC
Column
Analyst MH
Reviewer TDK

Reporting Subset
Spikes Subset
Specs Subset

Matrix W
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume (mL) Extract/Digestate Volume 356 (mL) Dilution Factor 1000	Measured Concentration ug/sample	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS		1110000	28.8	28.8

R E S U L T S

Work Order # 9510302
Page 10

Digestion Batch #

Analysis Batch # WLICXC51016150001

Project Sample ID THERM-7

Lab Sample ID 9510302-04A

File # ICXC1016-17

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Collected 10/06/95

Date Received 10/10/95

Date Prepared

Date Analyzed 10/16/95 15:00:00

Instrument ICXC

Column

Analyst MH

Reviewer IDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume ____ (mL) Extract/Digestate Volume 348 (mL) Dilution Factor 1000		Reporting Limit ug/sample
		Measured Concentration ug/sample		
Chloride	NO_CAS	1370000		28.8

RESULTS

Digestion Batch #

Analysis Batch # WLICK51016150001

Project Sample ID THERM-8

Date Collected 10/06/95

Instrument ICXC

Reporting Subset

Matrix W

Lab Sample ID 9510302-05A

Date Received 10/10/95

Column

Spikes Subset

Report As received

File # ICXC1016-18

Date Prepared

Analyst MH

Specs Subset

% Moisture

Method Chloride, by CARB 421

Date Analyzed 10/16/95 15:00:00

Reviewer IDK

Test Code CLIEWA00

Analyte	CAS #	Aliquot Mass/Volume (mL) Extract/Digestate Volume 268 (mL) Dilution Factor 1	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO_CAS	ND	0.0288	0.0288

10/30/95 13:36:10

R E S U L T S

Work Order # 9510302
Page 12Digestion Batch #
Analysis Batch # WLICXC51016150001

Project Sample ID THERM-RB
Lab Sample ID 9510302-06A
File # ICXC1016-20
Method Chloride, by CARB 421
Test Code CLIEWA00

Date Collected 10/06/95
Date Received 10/10/95
Date Prepared
Date Analyzed 10/16/95 15:00:00

Instrument ICXC
Column
Analyst MH
Reviewer IDK

Reporting Subset
Spikes Subset
Specs Subset

Matrix W
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume ____ (mL) Extract/Digestate Volume 362 (mL) Dilution Factor ____ 1		Reporting Limit ug/sample
		Measured Concentration ug/sample		
Chloride	NO_CAS	ND		0.0288

Digestion Batch #

Analysis Batch # WLICXC51016150001

Project Sample ID THERM-RB

Lab Sample ID 9510302-06A

File # ICXC1016-11

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Collected 10/06/95

Date Received 10/10/95

Date Prepared

Date Analyzed 10/16/95 15:00:00

Instrument ICXC

Column

Analyst MH

Reviewer TDK

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Analyte	CAS #	Aliquot Mass/Volume (mL) Extract/Digestate Volume 362 (mL) Dilution Factor 1	Measured Concentration ug/sample	Detection Limit ug/sample	Reporting Limit ug/sample
Chloride	NO CAS	ND	0.0288	0.0288	0.0288

10/30/95 13:36:10

LABORATORY BLANK INFORMATION

Work Order # 9510302
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Digestion Batch #
Analysis Batch # WLICXC51016150001

Lab Sample ID BLK954402
File # ICXC1016-8
Method Chloride, by CARB 421
Test Code CLIEWA00

Date Prepared
Date Analyzed 10/16/95 15:00:00
Instrument ICXC
Column
Analyst MH
Reviewer IDK
Reporting Subset
Spikes Subset
Specs Subset
Matrix W

Analyte	Aliquot Mass/Volume (mL) Extract/Digestate Volume 1 (mL) Dilution Factor 1	Detection Limit mg/L	Reporting Limit mg/L
	Measured Conc. mg/L		
Chloride	ND	0.0288	0.0288

Work Order # 9510302

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Matrix \bar{W}

Report As received _____

% Moisture _____

Aliquot Mass or Vol _____ (mL)

Extract Mass or Vol _____ 1 (mL)

Matrix \bar{W}

Report As received _____

% Moisture _____

Aliquot Mass or Vol _____ (mL)

Extract Mass or Vol _____ 1 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added	LCS Lab Sample ID <u>LCS956982</u> File ID <u>ICXC1016-9</u>			LCS Duplicate Lab Sample ID <u>LCS956982</u> File ID <u>ICXC1016-10</u>			Recovery Spec. Limits		RPD	
				Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
B30849P87													
Chloride				8.00	8.09	101	8.00	8.40	105	83	112	3.9	20

Work Order # 9510302

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Instrument ICXC

Column

Analyst MH

Reviewer TDK

Spike Sol'n # B30849P86	Vol., Added 200 uL	Sample Lab Sample ID 9510302-01A File # ICXC1016-12	Spiked Sample Lab Sample ID 9510302-07A MS File # ICXC1016-13	Spiked Sample Dup Lab Sample ID 9510302-08A MSD File # ICXC1016-14	Recovery Specifi- cation Limits							RPD	
Surrogate Sol'n	Vol., Added	Aliquot Mass/Vol 10 (mL) Extract Mass/Vol 335 (mL) Dil Fact., 1000	Aliquot Mass/Vol 10 (mL) Extract Mass/Vol 335 (mL) Dil Fact., 1000	Aliquot Mass/Vol 10 (mL) Extract Mass/Vol 335 (mL) Dil Fact., 1000	Measured Conc. ug/sample	Spiked Conc. ug/sample	Rec. %	Low %	High %	Result %	Specifi- cation Limit %		
Chloride	200	968000	1340000	2310000	100	1340000	2220000	94	80	120	6.2	20	

VERIFICATION

Analysis Batch # WLCXC51016150001

Initial Calibration # NA

Lab Sample ID CCV

File # ICXC1016-19

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Analyzed 10/16/95 15:00:00

Reporting Subset

Spikes Subset

Specs Subset

Instrument ICXC

Analyst MH

Reviewer IDK

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Chloride	6.05	6.00	101	90	110

10/30/95 13:36:10

CONTINUING (OR DAILY) CALIBRATION

Work Order # 9510302

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VERIFICATION

Analysis Batch # WLICX51016150001

Initial Calibration # NA

Lab Sample ID ICV

File # ICXC1016-7

Method Chloride, by CARB 421

Test Code CLIEWA00

Date Analyzed 10/16/95 15:00:00

Reporting Subset

Spikes Subset

Specs Subset

Instrument ICXC

Analyst MH

Reviewer TDK

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Chloride	6.00	6.00	100	90	110

SAMPLE DUPLICATES

Digestion Batch #

Analysis Batch # WLICXC51016150001

Project Sample ID THERM-6

Matrix W

Method Chloride, by CARB 421

Report As received

Test Code CLIEWA00

Date Collected 10/06/95

Reporting Subset

Date Received 10/10/95

Spikes Subset

Date Prepared

Specs Subset

Date Analyzed 10/16/95 15:00:00

Instrument ICXC

Column

Analyst MH

Reviewer TDK

Analyte	Sample Lab Sample ID 9510302-02A Dil Fact. 1000	Duplicate Lab Sample ID 9510302-03A DUP Dil Fact. 1000	RPD
	Measured Conc. ug/sample 1070000	Measured Conc. ug/sample 1110000	
	Chloride	3.8	20

CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY ADDENDUM

 RECEIVED BY: W. Rebr: l

 WORK ORDER(S): 9509449

 DATE: 9/23/95

 UNPACKED DATE: 9/25/95

NUMBER OF OUTER CONTAINERS RECEIVED

WITH CHAIN OF CUSTODY

 CLIENT CODE: THERMATEX
see addendum # 95-1006 for original airbill. ps
 (Check the appropriate answer. Add comments or explanations as needed)

 CUSTODY SEAL ON COOLER/OUTER CONTAINER BY: W. G.

 Present ☒ YES ☐ NO

 Custody Number initialed. #. ☐ YES ☐ NO

 Container sealed with tape ☒ YES ☐ NO

 Seal is intact ☒ YES ☐ NO

If seal not intact, list air bill number of that container(s).

 SAMPLE TEMPERATURE UPON ARRIVAL BY: W. G.

 PYROMETER # p-2

The temperature of the container(s) is: (acceptable tolerance 2 - 6°C)

 1 2°C 2 _____°C 3 _____°C 4 _____°C 5 _____°C 6 _____°C 7 _____°C

When samples are received not requiring cooling _____ NA

If the temperature(s) are outside the acceptable range of 2 - 6°C

Client Services was notified, (____ CSC) _____ YES

 OK to analyze samples: ☒ YES ☐ NO

All samples not listed below were within the acceptable temperature tolerance of 2 - 6°C. Samples affected and their temperatures:

Sample ID	Temp. (°C)	Sample ID	Temp. (°C)	Sample ID	Temp. (°C)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

CONDITION OF BOTTLES/CONTAINERS

BY: PCB (COMMENT ANY PROBLEMS)

Bottles received match COC

☒ YES ☐ NO

Bottles received intact

☒ YES ☐ NO

Comments:

pH OF SAMPLES/PRESERVATION

BY: PCB (COMMENT ANY PROBLEMS)

Acid preserved samples are <2 pH

☐ YES ☐ NO

(as indicated by * on COC)

Base preserved samples are >12 pH

☐ YES ☐ NO

(as indicated by # on COC)

Water samples for Cyanide checked

☐ YES ☐ NO

(as noted with a ✓ on COC)

Water Sulfide samples appear to be preserved with zinc acetate

☐ YES ☐ NO

☒ NA

If pH/preservation is outside acceptable limits, Client Services was notified

(☐ CSC) ☐ YES ☐ ADJUST ☐ YES ☐ NO

Sample IDs and pH of samples received outside of acceptable pH range.

All other samples not listed are at the appropriate pH.

Sample ID	pH	Sample ID	pH	Sample ID	pH	Sample ID	pH
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Comments:

SHIPPING DOCUMENTATION

Freightbill is available and attached to chain-of-custody.

OTHER COMMENTS: FedEx # 6686398596 ☒ YES ☐ NO
see addendum # 95-1006 for original a.r.b.ill. PCB

CLIENT CHAIN-OF-CUSTODY IS SIGNED/DATED WITH TIME BY SAMPLE CONTROL AS RECEIVED, WITH THE SAMPLE CONTROL ADDENDUM NUMBER NOTED IN THE COMMENTS SECTION.

SAMPLE CONTROL ADDENDUM VERIFIED BY: CD Achley ☒ YES ☐ NO
 DATE: 9/26/95

QUALITY CONTROL EXCEPTION REPORT
LEVEL 2 - SAMPLE CONTROL

REPORT COPY 9510302

ER # 951010-01

Revised:

Analyst: CDASHBY Instrument: _____ Date Analyzed: 10/10/95
Batch #: _____ Matrix: WATER/GAS Status: C
bt Spec: _____ Analysis File #: _____

Lab Sample ID:	Client ID:	CSC:	Project Sample ID:
<u>9510302</u>	<u>THERMATRIX</u>	<u>JGS</u>	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

PROBLEM IDENTIFICATION:

CORRECTIVE ACTION TAKEN:

Sample pH	_____	Resample	_____
Sample Temperature	<u>X</u>	Log for Analysis	<u>X</u>
Bubbles/Headspace	_____	Log Using Alternate Split	_____
in VOA Vials	_____	Use spare split	_____
Sample Broken	_____	Adjust Preservation	_____
Insufficient Sample Size	_____	Level 3 QCER to Follow	_____
Holding Time Exceeded	_____	Other (Describe)	_____
Upon Receipt	_____		
Other (Describe)	_____		

Comments: ALL SAMPLES RECEIVED FOR C1 ANALYSIS AT AMBIENT TEMPERATURE.

Distribution: CSC, Lab, Report

CHAIN OF CUSTODY ADDENDUM

 RECEIVED BY: CP Ashby

 WORK ORDER(S): 9510302

 DATE: 10/10/95

 UNPACKED DATE: 10/10/95

NUMBER OF OUTER CONTAINERS RECEIVED

 WITH CHAIN OF CUSTODY 1 box

 CLIENT CODE: Thermatrix

(Check the appropriate answer. Add comments or explanations as needed)

 CUSTODY SEAL ON COOLER/OUTER CONTAINER BY: CPA

 Present YES ✓ NO

 Custody Number # ✓ NO

 Container sealed with tape ✓ YES NO

 Seal is intact ✓ YES NO

If seal not intact, list air bill number of that container(s).

 SAMPLE TEMPERATURE UPON ARRIVAL BY: CPA

 PYROMETER #

The temperature of the container(s) is: (acceptable tolerance 2 - 6°C)

 1 °C 2 °C 3 °C 4 °C 5 °C 6 °C 7 °C

 When samples are received not requiring cooling NA

If the temperature(s) are outside the acceptable range of 2 - 6°C

 Client Services was notified, 955 CSC) ✓ YES

 OK to analyze samples: ✓ YES NO

All samples not listed below were within the acceptable temperature tolerance of 2 - 6°C. Samples affected and their temperatures:

Sample ID	Temp. (°C)	Sample ID	Temp. (°C)	Sample ID	Temp. (°C)
-----------	------------	-----------	------------	-----------	------------

<u>Received at ambient temp.</u>					
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

CONDITION OF BOTTLES/CONTAINERS

BY: CDA (COMMENT ANY PROBLEMS)

Bottles received match COC

☒ YES ☐ NO

Bottles received intact

☒ YES ☐ NO

Comments:

pH OF SAMPLES/PRESERVATION

BY: CDA (COMMENT ANY PROBLEMS)

Acid preserved samples are <2 pH

☐ YES ☐ NO

(as indicated by * on COC)

Base preserved samples are >12 pH

☐ YES ☐ NO

(as indicated by # on COC)

Water samples for Cyanide checked

☐ YES ☐ NO

(as noted with a ✓ on COC)

Water Sulfide samples appear to be preserved with zinc acetate

☐ YES ☐ NO

☒ NA

If pH/preservation is outside acceptable limits, Client Services was notified

(☐ CSC) ☐ YES

ADJUST ☐ YES ☐ NO

Sample IDs and pH of samples received outside of acceptable pH range.

All other samples not listed are at the appropriate pH.

Sample ID	pH	Sample ID	pH	Sample ID	pH	Sample ID	pH
-----------	----	-----------	----	-----------	----	-----------	----

<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
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<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
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Comments:

SHIPPING DOCUMENTATION

Freightbill is available and attached to chain-of-custody.

FLEX # 6686396242

☒ YES ☐ NO

OTHER COMMENTS;

CLIENT CHAIN-OF-CUSTODY IS SIGNED/DATED WITH TIME BY SAMPLE CONTROL AS RECEIVED, WITH THE SAMPLE CONTROL ADDENDUM NUMBER NOTED IN THE COMMENTS SECTION.

SAMPLE CONTROL ADDENDUM VERIFIED BY:

G. King

☒ YES ☐ NO

DATE: 10/10/95

ATTACHMENT C
CALIBRATION DATA



DRY GAS METER CALIBRATION DATA

October 6
testing

Dry Gas Meter # SAC-05

Calibration Meter # 309

Barometric Pressure $P_b =$ 29.99 in. Hg

Orifice Manometer (ΔH) in H ₂ O	Gas Volume, ft ³			Temperatures, °F				Time (Δt) minutes	γ^*	$\Delta H@^*$
		Cal. Meter (V _c)	Dry Gas Meter (V _d)		Calibration Meter (T _c)	Dry Gas Meter (T _d) In Out				
4.0	final	71.812	727.006	initial	91	98	92	4.42.65 (4.710)	1.015	1.91
	initial	66.632	721.900	mid.	91	102	92			
	total	5.180	5.106	final	91	102	91			
	avg.				91	96.5				
2.0	final	78.055	733.200	initial	92	99	94	6.39.55 (6.659)	1.012	1.94
	initial	72.925	728.100	mid.	92	102	95			
	total	5.130	5.100	final	92	103	96			
	avg.				92	98.1				
1.0	final	83.743	738.898	initial	92	100	96	9.13.23 (9.220)	1.011	1.88
	initial	78.643	733.800	mid.	92	102	97			
	total	5.100	5.098	final	92	103	98			
	avg.				92	99.3				
0.5	final	89.433	744.600	initial	92	101	98	12.47.78 (12.796)	1.011	1.82
	initial	84.350	739.499	mid.	92	102	99			
	total	5.083	5.101	final	92	103	100			
	avg.				92	100.5				

$$\gamma = \frac{V_c}{V_d} \left[\frac{T_d + 460}{T_c + 460} \right] \left[\frac{P_b}{P_b + (\Delta H / 13.6)} \right]$$

$$\Delta H@ = 0.0317 (\Delta H) \left(\frac{\Delta t}{V_c} \right)^2 \frac{(T_c + 460)^2}{P_b (T_d + 460)}$$

Date Calibrated: 9-11-95

By: Rich Howell

The γ and $\Delta H@$ values have been checked using the 'DGM-Calc' Program.

NOTE: Use a minimum volume of 5 ft³ at all ΔH values.

Acceptable Pre-Test Values: $(\bar{\gamma} \times 0.98) \leq \gamma \leq (\bar{\gamma} \times 1.02)$
 $(\Delta H@ \times 0.8) \leq \Delta H@ \leq (\Delta H@ \times 1.2)$

Acceptable Post-Test Values: $(\gamma_{pre} \times 0.95) \leq \gamma_{post} \leq (\gamma_{pre} \times 1.05)$



DRY GAS METER CALIBRATION DATA

Dry Gas Meter # SAC-05

Calibration Meter # 309

Barometric Pressure $P_b =$ 30.13 in. Hg

Orifice Manometer (ΔH) In H ₂ O	Gas Volume, ft ³		Temperatures, °F			Time (Δt) minutes	γ^*	$\Delta H@^*$		
	Cal. Meter (V _c)	Dry Gas Meter (V _d)	Calibration Meter (T _c)	Dry Gas Meter (T _d) In Out						
4.0	final	22.107	149.489	initial	72	72	4.75	1.010	1.93	
	initial	27.232	154.504	mid.	72	73				70
	total	5.125	5.015	final	72	75				70
			avg.	72	71					
2.0	final	32.353	159.555	initial	73	74	6.70	1.009	1.92	
	initial	27.232	154.504	mid.	73	76				71
	total	5.121	5.051	final	73	76				72
			avg.	73	73.2					
1.0	final	37.389	164.557	initial	73	75	9.2	1.008	1.86	
	initial	32.353	159.555	mid.	73	78				73
	total	5.036	5.002	final	73	79				74
			avg.	73	75.2					
0.5	final	42.403	169.560	initial	73	77	12.8	1.009	1.82	
	initial	37.389	164.557	mid.	74	80				76
	total	5.014	5.003	final	74	81				78
			avg.	73.7	77.8					

$$\gamma = \frac{V_c}{V_d} \left[\frac{T_c + 460}{T_d + 460} \right] \left[\frac{P_b}{P_b + (\Delta H / 13.6)} \right]$$

$$= \frac{5.125}{5.015} \left[\frac{72 + 460}{71 + 460} \right] \left[\frac{30.13}{30.13 + (4.75 / 13.6)} \right]$$

$$= 4.99033$$

$$2 - 0.9951$$

$$1 - 0.99756$$

$$0.5 - 0.99878$$

$$\Delta H@ = 0.0317 (\Delta H) \left(\frac{\Delta t}{V_d} \right)^2 \frac{(T_c + 460)^2}{P_b (T_c + 460)}$$

Pre-Test	<input checked="" type="checkbox"/>	Avg.	1.009	1.903
Post-Test	<input checked="" type="checkbox"/>	Pre-Test Avg.	1.012	1.89
Vacuum	<input type="checkbox"/>			

Date Calibrated: 10/24/95

By: Lafayette

The γ and $\Delta H@$ values have been checked using the 'DGM-Calc' Program.

NOTE: Use a minimum volume of 5 ft³ at all ΔH values.

Acceptable Pre-Test Values: $(\bar{\gamma} \times 0.98) \leq \gamma \leq (\bar{\gamma} \times 1.02)$

$(\Delta H@ \times 0.8) \leq \Delta H@ \leq (\Delta H@ \times 1.2)$

Acceptable Post-Test Values: $(\gamma_{pre} \times 0.95) \leq \gamma_{post} \leq (\gamma_{pre} \times 1.05)$

Sept 22
 testing

DRY GAS METER CALIBRATION DATA

 Dry Gas Meter # SAC-01

 Calibration Meter # 309

 Barometric Pressure $P_b =$ 29.92 in. Hg

Orifice Manometer (ΔH) In H ₂ O	Gas Volume, ft ³		Temperatures, °F			Time (Δt) minutes	γ^*	$\Delta H@^*$		
	Cal. Meter (V _c)	Dry Gas Meter (V _d)	Calibration Meter (T _c)	Dry Gas Meter (T _d) In Out						
4.0	final	396.272	608.415	initial	81	80	4.7	0.992	1.86	
	initial	391.047	603.203	mid.	81	81				80
	total	5.225	5.212	final	81	82				81
	avg.			81	80.7					
2.0	final	401.294	613.432	initial	81	83	6.4	0.999	1.86	
	initial	396.272	608.415	mid.	81	84				81
	total	5.022	5.017	final	81	84				82
	avg.			81	82.5					
1.0	final	406.318	618.467	initial	81	85	9.1	1.001	1.87	
	initial	401.294	613.432	mid.	81	86				82
	total	5.024	5.035	final	81	87				83
	avg.			81	84.2					
0.5	final	411.300	623.476	initial	82	86	12.5	1.000	1.79	
	initial	406.318	618.467	mid.	82	87				84
	total	4.982	5.009	final	82	88				85
	avg.			82	85.5					
$\gamma = \frac{V_c}{V_d} \left[\frac{T_d + 460}{T_c + 460} \right] \left[\frac{P_b}{P_b + (\Delta H / 13.3)} \right]$					Pre-Test <input checked="" type="checkbox"/>	Avg.	0.998	1.84		
					Post-Test <input type="checkbox"/>	Pre-Test Avg.				
					Vacuum <input type="checkbox"/>					

$$^* \Delta H@ = 0.0317 (\Delta H) \left(\frac{\Delta t}{V_c} \right)^2 \frac{(T_c + 460)^2}{P_b (T_d + 460)}$$

 Date Calibrated: 10/6/95

 By: Lisa Galt

 The γ and $\Delta H@$ values have been checked using the 'DGM-Calc' Program. /s/

 NOTE: Use a minimum volume of 5 ft³ at all ΔH values.

 Acceptable Pre-Test Values: $(\bar{\gamma} \times 0.98) \leq \gamma \leq (\bar{\gamma} \times 1.02)$
 $(\Delta H@ \times 0.8) \leq \Delta H@ \leq (\Delta H@ \times 1.2)$

 Acceptable Post-Test Values: $(\gamma_{pre} \times 0.95) \leq \gamma_{post} \leq (\gamma_{pre} \times 1.05)$

APPENDIX B
Field Data Sheets

Thermatrix Treatability Study System Parameter Data Field Log

(1" Hg)

Date	Time	Sampler's Initials	VME SVS System Vacuum	Blower Inlet Vacuum (in. Hg)	Blower Outlet Pressure (psi)	Blower Outlet Temperature (°F)	(scfh) Natural Gas Flow (cfm)	Thermatrix Flow		Thermatrix Outlet Pressure T (psi)(°F)	Outlet Temperature (°F)	Comments Sample Collected? (Sample ID) ^a
								Pressure (in. H ₂ O)	Calculated Flow (cfm)			
9/12	1500	CJM	3.5	15	0.25	180	6	0.80	4.8	1601	110	TIN-001 TEN-002
9/12	1530	CJM	3.5	15	0.25	180	6	0.75	4.7	1602	110	—
9/12	1610	CJM	3.4	15	1	179	6	0.75	4.7	1601	110	POST SAMPLE
9/13	1945	CJM	3.5	13	2	160	NA	0.85	5.0	1600	42	RUNNING ON AMBIENT AIR
9/13	1950	CJM	3.5	12	2	162	5	0.85	5.0	1600	42	TURNED VAPOR STREAM ON
9/14	0955	CJM	3.5	15	2	156	5	0.85	5.0	1601	80	TIN-003 TEN-004
9/14	1135	CJM	3.5	15	2	160	5	0.85	5.0	1600	80	—
9/15	1755	CJM	3.5	15	0.5	170	NA	0.85	5.0	1600	42	AMBIENT
9/15	1800	CJM	3.5	15	0.5	168	5	0.85	5.0	1600	42	VAPOR TURNED ON
9/19	0845	CJM	2.3	15	1.5	170	4	0.9	5.1	1600	80	—
9/19	1000	CJM	2.3	15	1	160	3	0.85	5.0	1605	85	TIN-005 TEN-006
9/19	1110	CJM	2.3	15	1	185	4	0.85	5.0	1600	85	POST SAMPLE
9/19	1915	CJM	2.3	15	1	182	4	0.85	5.0	1600	155	—
9/19	1945	CJM	2.3	15	1	150	4.5	0.85	5.0	1350 (EING)	48	AFTER SHUTTING TO SUCTION PUMP CENTRAL
9/20	0930	CJM	2.25	15	1	170	4.0	0.90	5.1	1600	175	TIN-007 TEN-008

^a If sample collected, indicate corresponding sample ID(s).

$$Q_{Lfm} = 1.41319 \sqrt{P \times 14.7}$$

Thermatrix Treatability Study System Parameter Data Field Log

11/16/95

Date	Time	Sampler's Initials	System Vacuum (in. Hg)	Blower Inlet Vacuum (in. Hg)	Blower Outlet Pressure (psi)	Blower Outlet Temperature (°F)	Natural Gas Flow (scfh)	Thermatrix Flow		Thermatrix Pressure (psf)	Outlet Temperature (°F)	Sample Collected? (Sample ID) ^a
								Pressure (in. H ₂ O)	Calculated Flow (cfm)			
9/20/95	1045	CJM	2.3	15	1	180	4	0.85	5.0	1600	180	POST INFLUENT SAMPLE SAMPLER PRELIMINARY TEN-010
9/20/95	1145	CJM	2.3	15	1	180	4	0.90	5.1	1600	185	POST TEN-011
9/21/95	0810	SAF	2.1	15	1	160	4	0.85	5.0	1600	165	TIN-010 TEN-011
9/21/95	0905	SAF	2.1	15	1	164	4	0.85	5.0	1600	175	↓
9/21/95	0745	SAF	2.0	15	1.5	150	4	0.85	5.0	1600	150	TEN-012
9/21/95	0650	SAF	2.0	15	1.5	150	4	0.90	5.1	1600	160	TIN-013
9/21/95	0955	SAF	2.0	15	1.5	152	4	0.90	5.1	1600	162.5	POST TIN-013
9/21/95	0745	SAF	2.0	15	2.0	140	4	0.90	5.1	1600	135	TIN-014 TEN-015
9/21/95	0848	SAF	2.0	15	2.0	152	4	0.90	5.1	1600	145	POST: TIN-014 TEN-015
9/21/95	1800	SAF	2.0	15	1.0	165	4	0.85	5.0	1598	150	No
9/21/95	0915	SAF	2.0	15	1.5	154	4	0.85	5.0	1600	140	TIN-016 TEN-017
9/21/95	1020	SAF	2.0	15	1.5	162	4	0.85	5.0	1600	148	POST TIN-016 TEN-017
9/21/95	0815	SAF	2.0	15	1.5	152	4	0.90	5.1	1600	240	TIN-018 TEN-019
9/21/95	1018	SAF	2.0	16	1.5	160	4	0.85	5.0	1600	240	POST TIN-018 TEN-019
10/21/95	0730	SAF	2.25	15	1.0	158	4	0.90	5.1	1600	6098 in. H ₂ O	TIN-020 TEN-021

^a If sample collected, indicate corresponding sample ID(s).

Thermatrix Treatability Study System Parameter Data Field Log

10/2/95

Date	Time	Sampler's Initials	Blower Inlet Vacuum (in. Hg)	Blower Inlet Pressure (psi)	Blower Outlet Temperature (°F)	Blower Outlet Pressure (psi)	Thermatrix Flow	Thermatrix Outlet Pressure (psi)	Outlet Temperature (°F)	Sample Collected? (Sample ID) ^a
10/2/95	0730	SAF	2.25	15	170	1	Pressure (in. H ₂ O) 0.90 Calculated Flow (cfm) 5.1 Natural Gas Flow (scfh) 4	1600	Gauge in. malfunctioning	Post TIN-020 TEN-021
10/3	1100	QJM	2.1	15	180	1	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	Gauge in. malfunctioning	NO
10/4	0735	SAF	2.25	15	150	1.5	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	↓	TIN-022 TEN-023
10/4	0845	Power Outage			Restarted Unit @ 0900					
10/4	0910	SAF	2.1	15	148	1.5	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1590	Gauge in. malfunctioning	TIN-022 TEN-023
10/4	1005	SAF	2.1	15	154	1.5	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	↓	Post TIN-022 TEN-023
10/4	1010	Shut	Unit down		to repair stack.					
10/5										
10/6	1530	SAF	2.1	15	180	1	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	110°F	Run #1 HCL sampling
10/6	1635	SAF	2.1	15	176	0.5	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	120°F	HCL Run #2 TIN-24 TEN-25
10/6	1840	SAF	2.1	15	176	0.5	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	122°F	Post HCL Run #3 TIN-24, TEN-25
10/10	0720	SAF	2.5	15	158	1.5	Pressure (in. H ₂ O) 0.9 Calculated Flow (cfm) 5.1 Natural Gas Flow (scfh) 4	1600	Gauge in. malfunctioning	TIN-26 TEN-27
10/10	0855	SAF	2.5	15	162	1.5	Pressure (in. H ₂ O) 0.9 Calculated Flow (cfm) 5.1 Natural Gas Flow (scfh) 4	1600	↓	Post TIN-26 TEN-27
10/11	1425	SAF	1.5	15	180	0	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	Gauge in. malfunctioning	TIN-028 TEN-029
10/11	1635	SAF	1.5	15	172	0.5	Pressure (in. H ₂ O) 0.85 Calculated Flow (cfm) 5.0 Natural Gas Flow (scfh) 4	1600	↓	Post TIN-028 TEN-029

^a If sample collected, indicate corresponding sample ID(s).

Thermatrix Treatability Study

[illegible]

^a If sample collected, indicate corresponding sample ID(s).

APPENDIX C

Quality Control Data Assessment

THERMATRIX Treatability Study

QUALITY ASSURANCE/QUALITY CONTROL RESULTS

This section presents the results of the Quality Assurance/Quality Control (QA/QC) data assessment for 30 air samples analyzed by Method TO-14, and 29 air samples analyzed by Method 18 modified. The samples were analyzed by Air Toxics Ltd. (Folsom, California). Quality control (QC) samples collected to assess contamination, precision and accuracy for the data set are presented in the following order: blanks (reagent); spikes (method and surrogate); duplicates (lab and field).

Overall, the QC sample results indicate good accuracy and precision for the sampling and analysis procedures. No reagent blank contamination was indicated. All of the method spikes (with one exception), and surrogate spike recoveries, and all of the Relative Percent Differences (RPDs) for laboratory duplicate samples, and field duplicates met established data quality objectives.

Reagent Blanks

Reagent blanks are used to demonstrate that interferences or contamination from the analytical system, including glassware and reagents used in the analytical procedure, are under laboratory control. No target analytes were detected, indicating that the analytical system was free of contamination and no sample results are affected.

Method Spikes

Method spikes, also known as laboratory control samples (LCS), are a solution of method analytes at known concentrations that are spiked into ultra high purity compressed air and analyzed to assess the accuracy of the method. The results are reported as the percent recovery of each spiked compound. One method spike recovery for o-xylene had a slightly low recovery. Three project sample results for o-xylene were qualified as "J-" estimated potentially biased low.

Surrogate Spikes

Surrogates were added to every sample, blank, and method spike to monitor both the performance of the analytical system and the effectiveness of the method in recovering the compounds of interest for each sample matrix. The percent recovery of the surrogate spike compounds were compared to the recovery objectives established for the method. All surrogate

spike results met acceptable limits, indicating that there were no problems associated with recovering target analytes using these methods.

Duplicates

Laboratory Duplicates

Laboratory duplicates are repeated, independent analyses of the same sample, by the same analyst, at essentially the same time and under the same conditions. The sample is split in the laboratory, and each fraction is carried through all stages of sample preparation and analysis. Duplicate analyses are used to assess the precision of each analytical method. Three project samples had laboratory duplicates performed by Method TO-14 (TIN-010, TIN-020, TIN-030). One project sample TIN-20 had a laboratory duplicate performed by Method 18 modified. Twenty-two pairs of results RPD's were all less than 29%, which is within acceptable limits for precision and indicates good overall reproducibility.

Field Duplicates

Field duplicate samples are used to evaluate the precision of the total measurement system and estimate variability in the entire sampling and analytical process. The sample identified as TIX-007 was a field duplicate of sample TIN-007, and TEX-032 was a field duplicate of TEN-031. Analysis of these samples by method TO-14 and Method 18 modified yielded seven analyte pairs for which RPD's could be calculated. All the calculated RPD's met the data quality objectives, indicating good precision and reproducibility.

Holding Times

Method protocol specifies the maximum amount of time a sample can be stored before analysis (i.e., the sample "holding time"). All samples were analyzed within the required holding times from sample collection to analysis.

Calibration Ranges

Five samples for trichloroethene by Method TO-14 exceeded the instrument calibration range, but were within linear range. These results were "J+" flagged estimated potentially biased high. Chloroform and toluene results for sample TIN-010 were reported below the detection limits, and have been qualified "U" non-detected at the specified detection limit.

TABLE 1. Qualified Data

METHOD	ANALYTE	REASON	QUAL FLAG	SAMPLE ID
TO-14	Trichloroethene	Calibration range exceeded, within linear range.	J+	TIN-028 TIN-016 TIN-010 TIN-020 TIN-013 TIN-020 (laboratory duplicate)
TO-14	o-Xylene	Method spike had a low recovery.	J-	TIN-007 TEN-009 TIX-008
TO-14	Chloroform Toluene	Results reported below detection limit	U	TIN-010

[illegible]

THERMATRIX Treatability Study Results

[illegible]

[illegible]

THERMATRIX Treatability Study Results

[illegible]

THERMATRIX Treatability Study Results

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THERMATRIX Treatability Study Results

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THERMATRIX Treatability Study Results

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THERMATRIX Treatability Study Results

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THERMATRIX Treatability Study Results

							Laboratory Duplicate				
Sample name:TIN-030							Sample name:TIN-030				
DC:10/13/95							DC:10/13/95				
DA:10/16/95							DA:10/16/95				
9510149-01A							9510149A-01B				
TO-14				dilution factor	dl (ppbv)	result (ppbv)	TO-14		result (ppbv)	dl (ppbv)	dilution factor
Vinyl chloride							Vinyl chloride		ND	1,900	3,800
1,1-Dichloroethene							1,1-Dichloroethene		ND	1,900	3,800
Freon 113							Freon 113		ND	1,900	3,800
cis-1,2-Dichloroethene							cis-1,2-Dichloroethene		17,000	1,900	3,800
Chloroform							Chloroform		ND	1,900	3,800
1,1,1-Trichloroethane							1,1,1-Trichloroethane		ND	1,900	3,800
Benzene							Benzene		2,300	1,900	3,800
Trichloroethene							Trichloroethene		590,000	1,900	3,800
Toluene							Toluene		ND	1,900	3,800
Tetrachloroethene							Tetrachloroethene		ND	1,900	3,800
m,p-Xylene							m,p-Xylene		8,200	1,900	3,800
o-Xylene							o-Xylene		6,500	1,900	3,800
Acetone							Acetone		ND	7,600	3,800
Modified Method 18							Modified Method 18				
9510149B-01A							9510149B-01B				
Vinyl chloride							Vinyl chloride		2,400	75.0	1.5

THERMATRIX Treatability Study Results

[illegible]

APPENDIX D

Cost Comparison Calculations and Data

TECO PNEUMATIC

CJM 11/10/95

COST COMPARISON DATA FOR CATDX - URS MONTHLY REPORTS FOR IC1, IC7, & OUC1

ASSUME LABOR COST OF \$60/HR

	HOURS OPERATING	LABOR (HR/HR OPERATION)	ELECTRICITY (KW/hr)	NATURAL GAS (THERM/HR)	LABOR (HR/HR MONTH)	(HR/MO)
IC1						
JUNE	645	0.2	23	6.7	0.17	(720)
JULY	412	0.3	23	7.1	0.17	(744)
AUGUST	193	<u>0.6</u>	<u>23</u>	<u>7.4</u>	<u>0.16</u>	(744)
AVG.		0.4	23	7.1	0.17	
IC7						
JUNE	370	0.4	60	5.7	0.22	
AUGUST	181	<u>0.7</u>	<u>23</u>	<u>9.5</u>	<u>0.17</u>	
AVG.		0.5	42	7.6	0.20	
OUC1						
JULY	128	1.1	23	1.7	0.18	
AUGUST	615	<u>0.2</u>	<u>23</u>	<u>2.2</u>	<u>0.20</u>	
		0.65	23	2.0	0.19	
OVERALL AVG.		0.5	29	5.6	0.19	
VALUES USED		—	23	5.6	0.20	

Table 3-6

Project Costs for June 1995

McClellan AFB, Site IC1

645 hrs.

DRES 94-9896

2/8

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$7,260	1	\$7,260	
Utilities					1
Electric	kwh	\$0.10	14,835	\$1,484	
Natural Gas	therm	\$0.50	4,344	\$2,172	
Water	1000 gal	\$0.75	116	\$87	2
Caustic	Gallons	\$0.60	150	\$90	
O&M Supplies	LS	\$1,000	1	\$1,000	3
TOTAL OPERATIONS COSTS				\$12,093	
MONITORING					
Contractor Labor	LS	\$6,158	1	\$6,158	
Analytical					
Mobile lab	Week	\$8,000	2.5	\$20,000	
TO-14 Analyses	Each	\$250	10	\$2,500	
Other analyses	LS	\$0	1	\$0	4
Stack Testing	LS	\$0	1	\$0	
TOTAL MONITORING COSTS				\$28,658	
DATA REDUCTION/REPORTING					
Contractor Labor	LS	\$10,110	1	\$10,110	5
Direct Costs	LS	\$800	1	\$800	
TOTAL DATA/REPORTING COSTS				\$10,910	

121 hrs

23 kwh

6.73 therm/hr

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 645 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Other analyses include residuals and fixed gases analyses.
5. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

412 hrs

Table 3-6
Project Costs for July 1995
McClellan AFB, Site IC1

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$7,500	1	\$7,500	
Utilities					1
Electric	kwh	\$0.061	9,476	\$578	
Natural Gas	therm	\$0.233	2,920	\$680	
Water	1000 gal	\$0.537	74	\$40	2
Water Discharged for Treatment	1000 gal	\$2.23	97	\$216	
Caustic	Gallons	\$0.60	130	\$78	
O&M Supplies	LS	\$1,800	1	\$1,800	3
TOTAL OPERATIONS COSTS				\$10,893	
MONITORING					
Contractor Labor	LS	\$5,800	1	\$5,800	
Analytical					
Mobile lab	Week	\$8,000	2.0	\$16,000	
TO-14 Analyses	Each	\$250	8	\$2,000	
Other analyses	LS	\$0	0	\$0	4
Stack Testing	LS	\$0	0	\$0	
TOTAL MONITORING COSTS				\$23,800	
DATA REDUCTION/REPORTING					
Contractor Labor	LS	\$12,500	1	\$12,500	5
Direct Costs	LS	\$800	1	\$800	
TOTAL DATA/REPORTING COSTS				\$13,300	

125 hrs
23/hr
7.1/hr

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 412 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Other analyses include residuals and fixed gases analyses.
5. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

Table 3-9

Project Costs for August 1995

McClellan AFB, Site IC1

193 hrs

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$7,000	1	\$7,000	
Utilities					1
Electric	kwh	\$0.061	4,439	\$271	
Natural Gas	therm	\$0.233	1,429	\$333	
Water	1000 gal	\$0.537	35	\$19	2
Water Discharged for Treatment	1000 gal	\$2.23	246	\$549	
Caustic	Gallons	\$0.60	220	\$132	
O&M Supplies	LS	\$800	1	\$800	3
TOTAL OPERATIONS COSTS					
				\$9,103	
MONITORING					
Contractor Labor	LS	\$6,000	1	\$6,000	
Analytical					
Mobile lab	Week	\$8,000	1.3	\$10,000	
TO-14 Analyses	Each	\$250	0	\$0	
Other analyses	LS	\$2,281	1	\$2,281	4
Stack Testing	LS	\$0	0	\$0	
TOTAL MONITORING COSTS					
				\$18,281	
DATA REDUCTION/REPORTING					
					5
Contractor Labor	LS		1	\$13,000	5
Direct Costs	LS		1	\$800	
TOTAL DATA/REPORTING COSTS					
				\$13,800	

116 hrs

23/hr

7.4/hr

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 193 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Other analyses include residuals and fixed gases analyses.
5. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

5/8

DRES ~~949~~ < 98, > 94

370 hrs.

Table 3-7

Project Costs for June 1995

McClellan AFB, Site IC7

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$9,599	1	\$9,599	160 hrs
Utilities					1
Electric	kwh	\$0.10	22,200	\$2,220	60 kwh/hr
Natural Gas	therm	\$0.50	2,113	\$1,057	5.7 therm/hr
Water	1000 gal	\$0.75	67	\$50	2
Caustic	Gallons	\$0.60	180	\$108	
O&M Supplies	LS	\$500	1	\$500	3
TOTAL OPERATIONS COSTS				\$13,533	
MONITORING					
Contractor Labor	LS	\$4,000	1	\$4,000	
Analytical					
Mobile lab	Week	\$8,000	2.5	\$20,000	4
TO-14 Analyses	Each	\$250	7	\$1,750	
Other analyses	LS	\$460	1	\$460	5
Stack Testing	LS	\$0	0	\$0	
TOTAL MONITORING COSTS				\$26,210	
DATA REDUCTION/REPORTING					
					6
Contractor Labor	LS	\$10,250	1	\$10,250	6
Direct Costs	LS	\$500	1	\$500	
TOTAL DATA/REPORTING COSTS				\$10,750	

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 370 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Mobile lab is apportioned between Sites IC 1 and IC 7.
5. Other analyses include residuals analyses.
6. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

Table 3-7
Project Costs for August 1995
 McClellan AFB, Site IC7

181 hrs

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$7,500	1	\$7,500	
Utilities					1
Electric	kwh	\$0.061	4,163	\$254	
Natural Gas	therm	\$0.233	1,712	\$399	
Water	1000 gal	\$0.537	33	\$17	2
Water Discharged for Treatment	1000 gal	\$2.23	141	\$314	
Caustic	Gallons	\$0.60	85	\$51	
O&M Supplies	LS	\$1,100	1	\$1,100	3
TOTAL OPERATIONS COSTS					
				\$9,635	
MONITORING					
Contractor Labor	LS	\$6,500	1	\$6,500	
Analytical					
Mobile lab	Week	\$8,000	1.0	\$8,000	
TO-14 Analyses	Each	\$250	0	\$0	
Other analyses	LS	\$0	0	\$0	4
Stack Testing	LS	\$0	0	\$0	
TOTAL MONITORING COSTS					
				\$14,500	
DATA REDUCTION/REPORTING					
Contractor Labor	LS	\$13,000	1	\$13,000	5
Direct Costs	LS	\$800	1	\$800	
TOTAL DATA/REPORTING COSTS					
				\$13,800	

125 hrs

23/hr

9.5/hr

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 181 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Other analyses include residuals and fixed gases analyses.
5. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

Table 3-10

Project Costs for July 1995

McClellan AFB, Site OU C1

128 hrs

DRES 94-96%

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$8,200	1	\$8,200	
Utilities					1
Electric	kwh	\$0.061	2,944	\$180	
Natural Gas	therm	\$0.233	222	\$52	
Water	1000 gal	\$0.537	23	\$12	2
Water Discharged for Treatment	1000 gal	\$2.23	7	\$16	
Caustic	Gallons	\$0.60	375	\$225	
O&M Supplies	LS	\$4,500	1	\$4,500	3
TOTAL OPERATIONS COSTS					
				\$13,184	
MONITORING					
Contractor Labor	LS	\$8,500	1	\$8,500	
Analytical					
Mobile lab	Week	\$8,000	1.0	\$8,000	
TO-14 Analyses	Each	\$250	22	\$5,500	
Other analyses	LS	\$0	0	\$0	4
Stack Testing	LS	\$11,900	1	\$11,900	
TOTAL MONITORING COSTS					
				\$33,900	
DATA REDUCTION/REPORTING					
					5
Contractor Labor	LS	\$16,213	1	\$16,213	5
Direct Costs	LS	\$800	1	\$800	
TOTAL DATA/REPORTING COSTS					
				\$17,013	

137 hrs

23/hr

1.7/hr

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 128 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Other analyses include residuals and fixed gases analyses.
5. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

Table 3-11

Project Costs for August 1995

McClellan AFB, Site OU C1

615 hours

DRES 969770

8/8

Description	Unit	Unit Costs	Quantity	Cost	Notes
OPERATIONS/MAINTENANCE					
Contractor Labor	LS	\$9,000	1	\$9,000	
Utilities					1
Electric	kwh	\$0.061	14,145	\$863	
Natural Gas	therm	\$0.233	1,324	\$308	
Water	1000 gal	\$0.537	111	\$59	2
Water Discharged for Treatment	1000 gal	\$2.23	26	\$58	
Caustic	Gallons	\$0.60	1,245	\$747	
O&M Supplies	LS	\$400	1	\$400	3
TOTAL OPERATIONS COSTS					
				\$11,435	
MONITORING					
Contractor Labor	LS	\$8,500	1	\$8,500	
Analytical					
Mobile lab	Week	\$8,000	1.8	\$14,000	
TO-14 Analyses	Each	\$250	17	\$4,250	
Other analyses	LS	\$6,783	1	\$6,783	4
Stack Testing	LS	\$0	0	\$0	
TOTAL MONITORING COSTS					
				\$33,533	
DATA REDUCTION/REPORTING					
Contractor Labor	LS	\$14,500	1	\$14,500	5
Direct Costs	LS	\$800	1	\$800	
TOTAL DATA/REPORTING COSTS					
				\$15,300	

Notes

1. Utility costs are paid by McAFB. Unit costs are typical estimates.
2. Water usage is estimated at 3 gallons per minute for 615 operating hours.
3. O&M Supplies includes filter bags, oils, parts, etc.
4. Other analyses include residuals and fixed gases analyses.
5. This item includes analytical data review, technical data management (IRPMS diskette deliverables), data interpretations for system optimization, and weekly/monthly report preparation.

TECO PNEUMATIC

JTM

1/4

11/8/95

THERMATEX CAPITAL COSTS

\$500,000 → \$300,000 FOR UNIT
\$200,000 FOR QUENCH/SLEWBER

$$\text{ANNUAL RATE} = 5\% \quad \text{DAILY RATE} = \frac{0.05}{365} = 1.37 \times 10^{-4}$$

$$5 \text{ YRS} = 1825 \text{ DAYS}$$

$$\text{DAILY AMT.} = (\$500,000) \frac{(e^{1.37 \times 10^{-4}} - 1)}{(1 - e^{-(1.37 \times 10^{-4} \times 1825)})} = \$309.67 / \text{DAY}$$

CATOX COSTS

\$350,000 (BASED ON DATA FROM MITRE)

$$\text{DAILY} = (350,000) \frac{(e^{1.37 \times 10^{-4}} - 1)}{(1 - e^{-(1.37 \times 10^{-4} \times 1825)})} = \$218.83 / \text{DAY}$$

REF.

THE MITRE CORPORATION. "SOIL VAPOR EXTRACTION CURTAILMENT PROCESS DEVELOPMENT".
JUNE, 1995.

2/A

Thermatrix Inc.

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Tel: (708) 717-2911
FAX: (708) 717-0284

101 Metro Drive, Suite 248
San Jose, California 95110
Tel: (408) 453-0490
FAX: (408) 453-0492

November 6, 1995

Ms. Courtney Morris
Radian Corporation
10389 Old Placerville Rd.
Sacramento, CA 95827

Dear Ms. Morris:

SUBJECT: THERMATRIX PROPOSAL NO. 5309: McClellan Air Force Base Remediation

Thank you for your interest in Thermatrix flameless oxidation technology and for the opportunity to submit this budget proposal for treating a remediation off-gas stream. The fume is air containing chlorinated and nonchlorinated hydrocarbons at a flowrate of 500 to 1000 CFM. Supplemental fuel gas is required to maintain normal operating temperature in the oxidizer. Dilution air is not required during normal operation but is required for startup. The oxidizer recommended for this application is a recuperative GRC-800.

Capital Cost:

Depending on the accessories or features required, the basic oxidizer budget price for the application above is:

APPLICATION	MODEL	BUDGET PRICE		
		BUDGET	TO	FROM
Remediation	GRC-800	\$300,000	+25%	-15%

The price does not include any applicable import, export, excise, sales, use or value-added taxes. It does not include spare parts, freight, handling, site preparation, foundations, installation, commissioning or performance testing. These parts and services are available for turnkey oxidizers.

Utility Requirements:

Based on 8760 annual operating hours, the estimated operating costs for the application described above would include:

CASE/MODEL	UTILITY COST ESTIMATE			
	Electrical Power*		Supplemental Fuel Gas	
	(KWH/KWH)		(\$3.00/mmBtu)	
GRC-800	7 Hp/6KW	\$3K/yr	0.5 mmBtu/hr	\$13K/yr

*Power consumption is based on air and fume blower motor requirements plus 1.2 KW control and instrument power.

A dilution air blower is provided with each oxidizer. A fume blower may be required to provide 25"WC static pressure necessary for oxidizer operation. It is presumed this blower would be installed near the fume source and can be provided as an option. The estimated power consumption for the fume blower is included above.

Page 2

Ms. Courtney Morris

November 6, 1995

Performance:

Thermatrix typically guarantees oxidizer performance to a limit of 99.99% VOC destruction or a limit of 1 ppmv total VOC in the system outlet. Typical thermal NO_x emissions are 2 ppmv, and CO is usually undetectable (less than 10 ppmv).

Other:

The oxidizer exhaust contains an estimated 2100 ppmv (9.5 lb/hr) of HCl which may require abatement depending upon local regulatory requirements. Halogenated compounds require corrosion resistant materials of construction in the oxidizer which are provided with the GRC model. A quench/scrubber system, designed to remove 98% of the acid gases from the oxidizer exhaust can be provided as an option. The budget price for the quench/scrubber system is \$200,000.

Various grades of corrosion resistant materials of construction in the oxidizer can be provided as an option depending on customer requirements. The base budget price includes an estimate for material upgrades due to the relatively high concentration of HCl. The prices of acid-resistant materials are subject to wide variations due to supply and demand. Price adjustment for material upgrades may be necessary depending on market conditions at the time of purchase.

Typical delivery of oxidizer systems, FOB Knoxville, Tennessee, is 22 weeks after receipt of purchase order, allowing 4 weeks for development of engineering drawings and documents and 2 weeks for approval by buyer.

We trust you and Radian Corporation will find this information useful and appreciate your interest in Thermatrix technology. We look forward to working with you on this application and also others in the future. If you have any questions or if we can provide further information, please contact Howard Hohl at (708) 717-2911. Thank you for the opportunity to be of service.

Sincerely,

William D. Binder, P.E.

William D. Binder, P.E.
Proposal Manager

cc: Howard Hohl, Thermatrix Inc.

TECO PNEUMATIC

CJM
11/10/95

4/4

COST FOR ADDITION OF SVE BLOWER TO THERMATRIX UNIT COST PROPOSAL

BLOWERS

OILLESS REGENERATIVE BLOWER, MOTOR MOUNTED
GAST RTP3160M 16 HP at 5" Hg (≈ 65 " H₂O) \rightarrow 600 cfm

$$(16 \text{ HP})(0.746 \text{ kW/HP})(\frac{1}{\text{70\% efficiency}}) = 17.1 \text{ kW}$$

\$2997 - 528 lb.

ACCESSORIES -

FILTER 2 X AJ126G (2)(177.00) = \$354

MUFFLER: AJ121GE \$188.50

RELIEF VALVE 2X AG 258 (2)(177.90) = \$355.80
\$898.3

TOTAL \$3895.3

30% FOR ENGINEERING, ETC. \$5,063.89

ENERGY REQUIREMENTS FOR BLOWER:

$$(16 \text{ HP})(0.746 \text{ kW/HP}) = 11.9 \text{ kW}$$

TOTAL THERMATRIX ENERGY REQUIREMENTS: ASSUME 3HP DILUTION AIR BLOWER

$$(3 \text{ HP})(0.746) = 2.2 \text{ kW} \quad 1.2 \text{ kW FOR CONTROL \& INSTRUMENT POWER}$$

$$11.9 \text{ kW} + 1.2 \text{ kW} + 2.2 \text{ kW} = 15.3 \text{ kW}$$

$$\text{DAILY USAGE} = (15.3 \text{ kW})(22 \text{ hrs}) = 336.6 \text{ kWh}$$

LABOR: 12 HR/WK (BASED ON 11/10/95 LETTER FROM BOB WILBOURNE, THERMATRIX)

$$\frac{12 \text{ HR/WK}}{168 \text{ HR/WK}} = 0.071 \text{ HR/LABOR/HR} \quad (0.071 \text{ HR/HR})(22 \text{ HR/DAY}) = 1.5 \text{ HR/DAY}$$

168 HR/WK

$$(1.5 \text{ HR/DAY})(60 \text{ \$/HR}) = \$90/\text{DAY}$$

TECO PNEUMATIC

QJM 11/10/95

THERMATEX NO_x:

$$1 \text{ ppmv} = 1,000 \text{ ppbv}$$

$$(1,000 \text{ cfm})(1,000 \text{ ppbv})(46)(2.63 \times 10^{-12})(60 \text{ min/hr}) = 0.007 \text{ lb/hr}$$

$$(0.007 \text{ lb/hr}) \left(\frac{\text{ton}}{2000 \text{ lb}} \right) \left(\frac{8760 \text{ hr}}{\text{yr}} \right) = 0.031 \text{ ton/yr} (1.3) = 0.040$$

$$(\$19,750/\text{ton})(0.040 \text{ ton/yr}) = \$790.00/\text{yr} \quad (\text{SEE NOTE 1})$$

$$\text{DAILY} = (790) \frac{(e^{1.37 \times 10^{-4}} - 1)}{(1 - e^{-(1.37 \times 10^{-4})(365)})} = \$2.22/\text{day}$$

CATOC:

5.3 ppmv - OUCI NO_x EMISSIONS FOR SEPTEMBER (URS, 1995)

$$(1,000 \text{ cfm})(5,300 \text{ ppbv})(46)(2.63 \times 10^{-12})(60 \text{ min/hr}) = 0.038 \text{ lb/hr}$$

$$(0.038 \text{ lb/hr}) \left(\frac{\text{ton}}{2000 \text{ lb}} \right) \left(\frac{8760 \text{ hr}}{\text{yr}} \right) = 0.17 \text{ ton/yr} (1.3) = 0.22$$

$$(\$19,750/\text{ton})(0.22 \text{ ton/yr}) = \$4,345/\text{yr}$$

$$\text{DAILY} = (4345) \frac{(e^{1.37 \times 10^{-4}} - 1)}{(1 - e^{-(1.37 \times 10^{-4})(365)})} = \$12.21/\text{day}$$

NOTES:

- 1) \$19,750/ton FROM FINAL CERF - AUTHORITY TO CONSTRUCT PERMIT APPLICATION (KACIAS, 1995)
BASED ON ERL TRANSACTIONS OCCURRING IN 1994

URS, 1995, "MCCLELLAN AFB SVE SITES IC 1, IC 7, AND OUCI. MONTHLY OPERATIONS REPORT - SEPTEMBER 1995"